

HANAU

Full ———
Denture ———
Prosthesis

Intraoral Technique for
Hanau Articulator
Model-H



FULL DENTURE PROSTHESIS

Intraoral Technique

FOR

Hanau Articulator Model H

BY

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Fourth Edition
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PREFACE TO THE FOURTH EDITION

The preceding edition has been subjected to a careful review; extensive revision, particularly of the nomenclature, was found necessary.

The terminology proposed by the author is used in the text and defined in the added chapter "Revised Terminology." Thus, the Fourth Edition promises increased pedagogic usefulness of its pages.

The author gratefully acknowledges the assistance of Drs. E. J. Farmer of Buffalo, Felix A. French of Ottawa, Robert R. Gillis of Hammond, A. Alfred Nelson of Detroit, Victor H. Sears of New York, R. O. Schlosser of Chicago, and W. H. Wright of Pittsburgh, in rearranging and revising the text of this and previous editions.

RUDOLPH L. HANAU.

INTRODUCTION

Without modification of the common principles involved, the Hanau Technique and Articulator are applicable to all branches of dental restoration, whether of natural or artificial teeth; but, in order to preserve succinctness, we shall here confine ourselves to the requirements and manipulations of full denture prosthesis. Full denture prosthesis embraces all the principles and elements involved in partial denture construction, periodontic and orthodontic operations. Thus, the Hanau Articulator Model H is used, not only as an articulating frame when modifying, restoring or constructing masticatory surfaces, but also serves as a diagnostic instrument. Again and again both uses have been successfully demonstrated by unbiased authorities.

The author, an engineer, compiled this technique and designed the instruments recommended; in consequence of his training he very naturally advocates: To first study, survey, plan, detail, and finally, to assemble and complete a construction contemplated.

Studying: infers a familiarizing with the fundamentals involved, **Surveying:** making and recording measurements of the problem or the case at hand, **Planning** visualizing, sketching and laying-out, **Detailing:** the consideration of material, form, position and function of individual and closely related elements, **Assembling:** a positional and functional co-ordination of all parts constituting the construction or mechanism as a whole, and **Completing:** applying the finishing touches.

Granting that such procedure is efficacious in engineering, why should it not be logical in the work of denture construction, which likewise involves the application of scientific principles of the highest order? If this question is answered in the affirmative, then no apology for proposing an exacting technique is needed.

It is assumed that the practitioner at the chair and in the laboratory is not primarily interested in the theories involved, but principally in a definite guide for operations and manipulations leading to satisfactory results. For this reason the general information is separated from the Hanau technique which is given in steps, each confined to the manipulations proper. A technique is not complete without appropriate instruments, especially not when carrying out such exacting work as is demanded in modern dentistry. Therefore, it is of utmost importance to use instruments which lend themselves to ready and practical application. And for this reason, it was necessary to build a more refined and more practical articulator than was available.

GENERAL INFORMATION

Technique and Articulator:

The Hanau Instruments and Techniques are based upon valuable findings and interpretations of early and recent investigators. Their logical thoughts and many excellent points of instrumentation were carefully studied, scrutinized, modified where necessary, and finally fused with a definite and practical method of making mandibular registrations which take into consideration the resilient and like effect of the tissues upon these registrations.

Incidentally it was necessary to develop an articulator, which, with the technique

1. Lends itself to convenient and accurate application of registrations,
2. Is practical to manipulate,
3. Is simple and precise in function,
4. Allows succinct comparison of findings and results,
5. Permits compensation for the resilient and like effect of the tissues in the mouth, which latter do not exist in the articulator, because a mounting of casts or models in an articulator is rigid.

An articulator, in the prosthetist's hands, is primarily a setting-up instrument for arranging the masticatory surfaces into articulation, in such a manner, that the selected teeth are not unduly mutilated by grinding down their cusps; thus, grinding-in, though important, becomes a secondary operation.

The Hanau Articulator is not intended to be an "anatomical articulator" as interpreted in the dental literature. Proofs why and how an articulator should deviate in its functions from the anatomical apparatus have been given by the writer and these proofs were amply substantiated by researches, which have shown that the articulator jaw members should produce move-

ments, **equivalent** to those of the mandible to the maxillae. The writer has officially demonstrated that movements of the jaw members of an articulator have a definite relation to the anatomical movements, and that both are by no means the same, but must be **equivalent**, in order to compensate for the effect of the resilient supporting tissues upon which prosthetic dentures function in the mouth. The deviation of articulator movements from anatomical movements increases with the increase of the resilient and like effect.

The Hanau Articulator and Technique give consideration to the resilient and like effect of the tissues, and also to our limitations in making mandibular measurements. More than that; definite means to determine, interpret and eliminate errors, are incorporated:

1. A method to make reliable rest records in the mouth.
2. Compensating features and adjustments of the articulator.
3. The making of articulator records, and their check and correction in the mouth.
4. Pointing out the limitations of and tolerances for mandibular measurements and their compensations.
5. The Correction Technique.

Essentials, such as the face-bow application, the occlusal rim preparation, setting-up of the teeth, etc., are inseparable from a technique of this character. They are treated more or less in detail, depending upon their bearing and importance to the technique proper.

The underlying thought of the technique is the recognition of the fact that utmost precision is required to obtain balanced articulation, and that measurements of the resilient anatomical apparatus, when taken, are none too accurate to begin with. Nevertheless, precision is the ultimate goal.

Balanced articulation assures efficient function of the dentures, because it enhances their stability, eliminates undue tissue changes in the mouth and adds to the comfort of the patient.

Be it emphasized: the ultimate object of the Hanau Technique and instrument is to enable the operator to achieve balanced articulation of the masticatory surfaces in the mouth of the patient.

RECORDS—PRINCIPLES—ADJUSTMENTS

A record is the fixation of a registration by means of a suitable instrument, device or material. It is made permanent or reproducible by applying suitable registering methods and devices in conjunction with impressions, calibrated adjustments, etc.

The Hanau Articulator and Technique involve two distinct kinds of records:

1. Unstrained records.
2. Strained records.

Unstrained records are used for initial setting of articulator adjustments. They are used for mounting the impression cast in unstrained centric relation, for determining the condylar indications and to set up the teeth in wax; also to remount the vulcanized denture and to grind them into unstrained balanced articulation. Finally the so-called correction technique applies. At this time strained as well as unstrained records are utilized to compensate by relief-grinding for the resilient and like effect.

The magnitude and direction of forces and their points of application during a registration are beyond the control of the dentist and the patient. It is logical to conclude that any method suggesting to record jaw relations under pressure is unreliable for initial articulator mountings and adjustments.

Of all magnitudes, directions and points of application of forces, which a patient can possibly apply, there is only one reliable and definite combination, and that is, the magnitude of force ZERO, a force which has no direction nor point of application.

A method was therefore developed to register all relations as used for the initial articulator adjustments with a closing force of zero, that is, when the masticatory surfaces are in balanced contact and no closing pressure is applied.

Biting in itself infers the application of force. Therefore, the biting into wax, etc., is always coincident with an application of force. In order to reduce the magnitude of this force to a practical minimum to begin with, the material used for making a record should be of a very soft and even consistency at the time the record is made. It should also possess the property of becoming hard after the record has been obtained. Some compounds and wax compositions possess both these properties to a very satisfactory degree; the first when heated and the latter when cooled or chilled.

Because of our inability to predetermine and maintain exactly the required distribution and consistency of the interposed wax, it occurs that some parts of the recording surfaces offer greater resistance than others, in which event an undue strain is transmitted to the tissues in the regions of greater resistance.

The parts where the denture intrudes into the soft tissues are detected in various ways: (1) visually, (2) digitally, (3) by interpretation of the patient's sense of touch, and (4) by measurements.

ADJUSTMENTS

Mechanical adjustments of an instrument and the mode and purpose of making these are features which cause various techniques. The Hanau Articulator Model H and Technique is an original combination and, to the writer's knowledge, the only one of which not a single claim has been disproved. Both have been subjected to the most severe tests by able investigators and groups of specialists.

The mechanical adjustments of the Hanau instruments are extremely simple, yet definite and practical in construction and manipulation; their purpose is to guide the jaw members to make movements equivalent to those of the mandible.

DENTURE BASES AND OCCLUSAL RIMS

Occlusal rims are "dummy" dentures, used by the prosthetist to fill the space left between the edentulous

ridges, the tongue, the cheeks and the lips. They often are contoured to conform to the preliminary requirements of esthetics of the proposed denture restoration. The occlusal rims further serve as an important means to register, record and transfer accurate ridge relations and requirements of mandibular function. It is urged to build occlusal rims of a material such as compound or well hardening wax material of high melting point, upon denture bases only.

In the past, no attention whatsoever seems to have been given to the influence of the character of the seating surfaces of a denture or its equivalent, upon the adjustments of an articulator. The writer reasoned—and it has since been found correct—that the size and shape of the seating surfaces and the magnitude and distribution of the resilient tissues affect the results of registrations, and thereby lead to different articulator adjustments.

In order to eliminate a change of the resilient effect, this technique suggests for all registrations the employment of bases, which have the same form of seating surfaces and borders as are ultimately used in the mouth of the patient. These bases shall be referred to as **denture bases**.

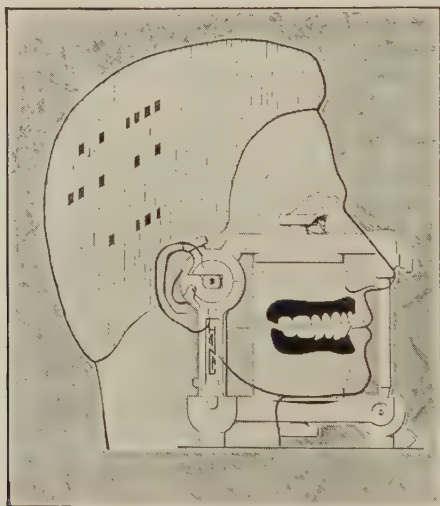
It has been found most satisfactory to utilize only denture bases for building up the occlusal rims as well as for making records subsequently necessary for articulator mountings and adjustments and setting-up of the teeth.

Metal bases, ultimately used with the finished dentures, are the most reliable denture bases from the viewpoint of making measurements. They may have been cast, swagged, or otherwise prepared. Second in order of reliability, are vulcanized bases. Bases made of Ashe's Art Metal and also compound lined base plate material **may** satisfactorily serve at times. The use of the original impressions for making measurements is not recommended by the writer, mainly because of the difficulties encountered when attempting re-checks. Bases made of base-plate material only are unreliable, because they do not assure the same seating surfaces the ultimate denture has, and in addition, they are subject to distortion.

THE FACE BOW RECORD

Almost every dentist is conscious of the existence of the face bow; a great many were using it; yet, not too many were deriving the full benefit of its use, because of lack of suitable instruments, omissions, oversights, or deficiencies of steps of denture restoration, from which it cannot be separated.

We rely upon this instrument to record the correct positional relation of the maxillary ridge in the patient and to transfer this relation to the articulator, thereby producing a positional relation, which enhances succinct interpretation of the maxillo-mandibular conditions. The



A set of dentures mounted on the Hanau Articulator Model H, superimposed upon the face, to illustrate the positional relations of dentures in the mouth and the articulator.

face-bow technique, substantially as given by Gilmer and Snow, is one of the finest and most elegant contributions to dental metrology. The face bow record and transfer are simple and expeditious operations offering substantial advantages, well worth to invest from one to five minutes. Failure to use the face bow brings about complications which may only be compensated for by consideration of factors irrelevant to denture construction.

The elimination of the face bow technique was excusable in the past, for we had no complete, definite technique to profit by the advantages it offered. The application of the face bow in teaching and practice will be continued by those who prefer systematic procedures to penny wisdom and pound foolishness.

The writer, therefore, does not recommend the omission of the face bow technique, nor does he wish to encourage unskillful application, because an arbitrary or faulty mounting introduces several irrelevant and confusing considerations.

CENTRIC RELATION RECORD

Of all records, centric relation rest record is the most important. It is also the most difficult one to obtain and to check correctly. There are numerous methods in vogue to establish centric relation. Of all these methods the Gysi Gothic arch tracing is the most admired, because it is the only scientific method existent which lends itself to graphic and other demonstrations.

The arrow point tracing* is a basic contribution to denture prosthesis, as important as the face bow. It constitutes a link in a chain of operation, but does not give results per se. It therefore should not be underestimated, nor in enthusiasm overrated.

The patient is directed to close the mandible to the desired jaw separation in centric relation, in order to register the position of the mandibular ridge to the maxillary ridge. Thus the space is established into which the finished dentures are ultimately inserted. In making the first record with occlusal rims built upon denture bases, or their equivalent, let us assume, (as we should) that there was unequal resistance to the closing force at the various parts of the closing surfaces, causing unsuitably distributed pressure upon the supporting tissues.

Those parts of the closing surfaces which were under

*The arrow point design was given by F. H. Balkwill in a paper read before the Odontological Society of Great Britain, June 4th, 1866.

undue pressure are the ones which become raised, when the pressure is released. These raised parts make premature contact upon closing.

The raised parts thus detected may be reduced or the parts making no contact built up. The high spots are reduced by reheating them and the area around them over the flame and directing the patient to close, whereby the still softened and plastic areas are reduced. Those parts of the closing surfaces which failed to make contact are built up with molten or suitably softened wax and the patient is again directed to close, thus evening the recording surface.

By means of one or both of these expedients, which may have to be applied repeatedly, the record is reduced in height or built up until an even contact of the entire closing surfaces under no pressure is accomplished. The very last operations usually are: to lightly heat one entire closing surface over the flame and to direct the patient to close very gently into the accomplished centric relation rest record, which, when thoroughly chilled, is again tested.

The arrow point tracing is generally considered a check of an already established centric relation. In skilled hands it is often of great help while establishing centric relation, however a new incisal tracing should be made for check. An experienced denture prosthodontist will not shirk the additional time which such a seeming detour involves, for he already knows what it means to "miss the bite".

"Missing the bite" is the prime cause of denture instability, discomfort and tissue alteration. These three items form a vicious cycle which inevitably dilapidates the denture supporting tissues, thereby changing the original condition from bad to worse. The fact, that the helpless patient tolerates the bad or the worse, does not alter the situation in the least.

The failure to register unstrained centric jaw relation (to make a centric relation rest record) is observed too frequently. Masticatory function in all its stages becomes automatically impaired in consequence thereof.

PROTRUSIVE RELATION RECORD

The general practitioner and many specialists of yesterday did not bother with a registration of the protrusive jaw relation, simply because they figured out, or were told by others, that it is unnecessary to consider condylar guidances.

The protrusive registration is essential. Christensen was the first to make protrusive records. Here again, we register an important step forward in denture prosthesis.

It was Christensen's and all of the following investigators' and practioners' belief, that a geometrical reproduction of the direction of the condylar guidance was required in the articulator. That this is not so, has been brought out by your writer in 1921.

The relative movements of points of the articulator jaw member and of their corresponding anatomical points have the same starting positions, but differ in directions, depending upon the resilient and like effect of the tissues involved.

Whatever the starting points and directions of accepted centers or points of the anatomy may be, we should always produce their equivalent movements in the articulator. The direction and magnitude of these equivalent movements approach the anatomical movements closest, when the realeff* decreases and the closer they are to the masticatory surfaces.

Articulator and anatomical movements do not, and need not coincide mathematically, but must be equivalent:

1. On account of the limitations of an instrument,
2. On account of limitations of anatomical records,
and
3. Because certain compensations are automatically taken care of by mechanism and technique.

Due to these limitations and because the mode of function required of an artificial denture is different from that of a natural denture, provisions have been made in

*The term realeff is coined by contracting the beginnings of the words RESilient And Like EFFect.

technique and articulator, which enable compensation for limitations and difference of mode of function.

The protrusive relation record is required to adjust the horizontal condylar indication, so that the instrument jaw members perform movements which are equivalent, but not identical to the relative movements of the mandible to the maxillae.

The wax or compound record is interposed between the closing surfaces of the occlusal rims, or their equivalent. The protrusive relation record is then obtained like the centric relation record, of course, the patient is directed to close in protrusive relation.

Sometimes we may omit an interposed record and prefer to soften the closing surface of one occlusal rim, or we may find it convenient to apply registering blocks or staples on the labial and buccal surfaces of the rims. Such deviations from the recommended procedure do not affect in any way the principles involved. They may complicate interpretation and add uncertainty of registration.

LATERAL RELATION RECORD

The Hanau Articulator Model H is so designed that dentures built on it articulate in the mouth with a component of over-protrusion within a range mentioned. That means, they have the tendency to find premature contact of the distal inclines of the lower cusps with the mesial inclines of the upper cusps, if they would have to articulate in what is considered theoretical anatomical articulation.

Your writer at present holds the opinion, that the setting of a lateral indication by an anatomical record does not offer any particular advantages to start with. It is his experience, that the required over-protrusion on the working side in lateral cannot and need not be predetermined, but, that it is to be established on the finished case in the mouth, by records, observation and interpretation of symptoms on the ridges.

In order to avoid laborious operations and the difficulties and inaccuracies encountered in recording suitable

lateral relation records with occlusal rims (or their equivalent), it is recommended to employ the following formula to arrive at acceptable lateral indications:

The formula:

$$L = \frac{H}{8} + 12$$
 is recommended and used with the Hanau Articulator Model H for initial settings of the lateral (sagittal) indications since 1922, and it has been found satisfactory for that purpose.

In this formula:

L=lateral condyle indication in degrees, and

H=horizontal condyle indication in degrees as established by the protrusive relation rest record.

The plus or minus read on the calibration is disregarded in the formula, which was arrived at graphically by plotting experimental and experience values.

Any undesirable degree of over-protrusion which may be embodied in the denture may also be eliminated by manipulation of particularly the lateral condyle adjustment of the articulator, and consequent grinding (Correction Technique).

The reading of the horizontal indication on graduation X (see illustration page 43) without regard to minus or plus is taken, divided by eight and twelve added. The result gives the setting for the lateral indication, which is read on graduation Y at the base.

Lateral indications above 20° need not be considered for the time being (they rarely have to be), though they have been registered with the aid of lateral relation records. This conclusion has been reached after careful measurements were made with the Hanau Kinoscope and after these measurements were scientifically interpreted.

This technique ordinarily does not employ lateral relation rest records taken in the mouth for articulator adjustments, yet a lateral relation rest record is sometimes obtained and its use indicated, because the patient fails to give a true protrusive relation record. In such a case, the lateral relation rest record is used to adjust the articulator's horizontal condyle indication on the balancing side only. Lateral relation records made in the articulator are frequently verified in the mouth.

If a horizontal indication obtained with a checked lateral relation record deviates unreasonably from one obtained with a checked protrusive relation record, then it should be recorded in writing with the other notes. Each indication is then used separately for the lateral and protrusive requirements. Extraordinary deviations, which are not the rule, and if found, are attributed to realeff.*

OPENING AND CLOSING THE DENTURE SPACE

The desire is frequent to "open or close the bite" indiscriminately after having mounted the casts, representing the ridges, on an articulator.

An articulator, or an attachment thereon, could be designed and built with special adjustments for opening or closing the maxillary space over a wide range while retaining centric relation. However, such provision is only obtained at the expense of unduly complicating the instrument and technique. Under no circumstances should the bite be opened or closed indiscriminately on any hinge mechanism; firstly, because the anatomical apparatus does not open or close with a true hinge effect, and secondly, because we should not expect to be able to make a mathematically correct transfer from the anatomy to the articulator.

It is necessary always to reascertain the correctness of centric relation after opening or closing the intermaxillary or denture space on an articulator and to re-establish it by taking a new centric relation record and remounting the (lower) cast, if found incorrect. The unroundness of the condyle head is mainly responsible for this.

The range of opening and closing in the articulator (if that is insisted upon by theorists) may be increased by using the face-bow with a slight modification of the customary procedure. It is customary to have the extensions of the face-bow center over the accepted locations of the anatomical condyle centers. Instead, the face-bow extensions could be placed over the cinematocal axis. The

*The term realeff is coined by contracting the beginnings of the words REsilient And Like EFFect.

meticulous determination of the cinemactical centers on the face for the face-bow adjustments does not justify the reward of obtaining a slightly increased range of opening and closing in the articulator, except in rare cases, such as amputated condylar processes.

REASONABLE TOLERANCE

We very frequently read or hear of "accurate," "exact" and similar attributive adjuncts in connection with mandibular measurements. Your writer has come to the conclusion that all measurements of living tissues need not be more than reasonably accurate in order to be scientifically acceptable and useful in practice. His conception of reasonable accuracy of mandibular measurements is given in Dental Engineering. The only exacting records are the jaw relation records, and these are controllable within minute fractions of an inch.

"Mathematical accuracy" is the ideal—the goal the ambitious approaches asymptotically, yet, never will reach. Therefore, in order to understand prosthesis better, and in order to be able to build better denture restorations systematically and with less effort, we should always make our records skillfully and obtain reasonable approximations.

This candid review should encourage rather than discourage investigators, teachers, practitioners and students. An understanding of the true situation will eradicate diffidence and prevent being deceived by lacquered truths and pseudo-scientific theories.

DENTURE STABILITY

The stability of a denture depends on many factors, of these we enumerate:

1. Adaptation of the seating surfaces to the supporting tissues.
2. The height of the ridges.
3. The inclination of the ridge walls.
4. The shape and form of the ridges.
5. The size of the arch.
6. The renitent properties of the ridge tissues.

7. The magnitude, direction, point of application and duration of force.
8. The adhesive properties of saliva to tissue.
9. The adhesive properties of saliva to restoration.
10. The viscosity of the saliva.
11. The quantity of the saliva.

The seating surface of a restoration is the end product of impression and laboratory work. The seating surfaces and the supporting tissue surfaces are not exactly alike; an increasing difference in form is caused by a greater variation of the resilient and like effect of the supporting areas. The height of the ridges, the inclination of the ridge wall and their arch forms are remainders of a once more complete anatomy; the renitent property of a ridge is a resultant of the distribution of soft and osseous structures of the remainders.

The magnitude, direction, point of application and duration of forces is due to two sources: The supporting tissue and minor muscles apply pressure to areas of the seating surfaces and their borders, while major muscles, not in direct contact with the dentures, exert the forces of mastication, indirectly.

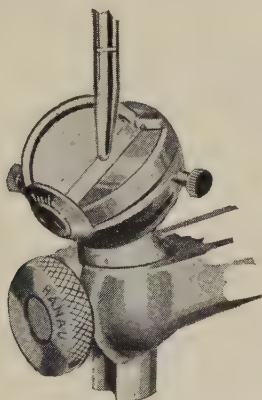
The viscosity of the saliva infers molecular cohesion, in consequence of which we have more or less cohesion in the film between tissues and restoration. Thus a high viscosity of the saliva reduces the tendency of separation and also the "pumping action" of the dentures in function. The efficacy of this "pumping action", which sometimes is very vigorous, is also greatly influenced by the total quantity of saliva present. Reasoning in terms of Physics brings us to the conclusion:

1. Well adapted seating surfaces enhance stability.
2. High, renitent ridges with fairly inclined walls and well extended arches enhance stability.
3. Viscous saliva in a quantity not "floating" the dentures enhances stability.
4. The presence of a cushion of evenly distributed soft tissues enhances stability.
5. The absence of shock-like and vibration-like acting forces enhances stability.

6. The stability due to the cohesion of the saliva molecules suffers with an increase of the film thickness, with a diminishing viscosity of the saliva film and with the application of continual forces, particularly small forces such as are incident to cusp interference.
7. The ratio of the periods of force application to the periods of rest is an important consideration.

INCISAL GUIDE

In good, practical prosthetic full denture work, there is at present no urgent need for what has been defined a "theoretical" or a "scientific" incisal guide, such as the Universal Incisal Guide, see illustration. There will be when the operator becomes familiar with all theoretical factors which govern incisal guidance.



Universal Incisal Guide attached to Hanau Articulator. Model H

The incisal guide as a mechanism should have a suitably curved guiding surface, which is adjustable in three dimensions to accommodate certain physical and esthetic requirements of denture construction.

The incisal guide adjustment presented a problem very much similar to that of the adjustment of the lateral condyle guides. It required considerable effort, expenditure, labor and time, to arrive at a practical design of the guiding surfaces on account of the complex and reciprocal influences of the incisal guiding surfaces upon the many factors enumerated below.

The Standard incisal guide of the Hanau Articulator Model H consists of a spherical element having specially formed guiding surfaces; it is adjustable in three dimensions within considerable range.

The Standard incisal guide has passed through more than a dozen modifications before it assumed its present simple and practical form.

The adjustments of an incisal guide are primarily governed by:

1. The incisal guidance contemplated in the mouth (overbite and overjet),
2. The cusp formation of the posterior teeth,
3. The compensating curves contemplated,
4. The plane of orientation, and
5. The condylar indications (horizontal and lateral).

Intricate and reciprocal relations exist between these important factors. The subject will be treated separately under: "Laws of Articulation".

It is advantageous to give special consideration to the relation existing between the incisal guidance and the condylar guidances, as governed by the requirements of prosthetic articulation. The consideration of this relation is a good method to decide the approximate incisal indication for the articulator.

Usually it is necessary to associate a flat incisal guide with steep condylar guides and vice-versa, in order to fulfill purely techno-mechanical requirements, given by the form and shape of the teeth available in the market. For the same reason, it is practical to provide an **antero-posterior** incisal indication harmonizing with the mean average of differing condylar inclinations, and then to associate a steeper lateral incisal guide in coaction with a flatter condylar guide—and vice-versa. In other words: If all other things are equal, the incisal guide of a denture is steepest diagonally across on the side opposite the flatter condylar guide.

This applies to conditions in the articulator **and in the mouth**, with this important difference: The incisal guide for lateral excursions in the articulator has to be

steeper on the same side, because the articulator is a cinemactical reversal of the anatomical apparatus. Therefore, when the incisal guide pin traverses the right half of the incisal guiding surface on the articulator, it furnishes a guide for the lower incisors on the left.

It has been found advantageous to start a setting-up of teeth with the following incisal indications:

Condylar Indications:	Incisal Indications:
Minus 5° and below	35° or more
Minus 5° to plus 20°	25° to 40°
Plus 15° to plus 30°	15° to 30°
Plus 25° to plus 45°	5° to 20°
Plus 40° and above	10° or less

Those mathematically and mechanically inclined may deduct from the wide range of mutations of the associations of incisal and condylar guides, that there are more important considerations, than the mechanical problem which already has been solved for theoretical, scientific and practical purposes.

SOMETHING ABOUT TEETH

Many of us do not have a highly developed sense of discerning harmony. Therefore, we may profitably utilize the helpful charts and thumb rules which systematize tooth form and facilitate their selection.

Teeth are tentatively selected to harmonize in form and hue to the generally accepted esthetic standards, modified by three factors: the dentist, the patient and the environments. It is assumed that due consideration is given to the patient's and his environment's justified demands. It then remains for the dentist to accept or to modify his choice.

Smooth function of teeth is achieved by establishing balanced occlusions; which means balanced articulation. Function also becomes efficient, if balanced articulation is secured by proper positions and alignment of the teeth,

and by effective formation of their masticatory surfaces. These factors are governed by the patient's individual anatomy and his natural or acquired habits.

Both, the anterior and the posterior teeth participate more or less in the exacting functions of mastication and speech. The alignment and position of the anterior teeth in the space between the ridges, the tongue and the lips greatly affect pronunciation as regards fullness and distinctness of speech. It so happens that the requirements of phonetics closely coincide with those of esthetics.

We have more freedom in aligning the posterior teeth in the space left between the ridges, the tongue and the cheeks, because they are of minor importance to phonetic and esthetic demands. The main function of the bicuspids and molars is mastication. In order to fulfill this function, which is purely physical, all the teeth must be appropriately shaped and properly aligned in conformity with physical and physiological requirements.

The alignment of the teeth, the selected formation of their masticatory surfaces and the position of the dental arches in the masticatory apparatus have a reciprocal influence upon each other. This influence is formulated in the "Laws of Balanced Articulation."

The ten main laws are graphically related in the "Articulation Quint." This Quint greatly facilitates the application of the laws. (page 34).

Repeated efforts have been made to standardize the setting up of teeth by aligning them along a preconceived geometrical curve or surface without giving full consideration to individual function (Gysi, Needles, Hall, House, Monson, Wadsworth, etc.). All these methods could not but prove unsatisfactory, because they disregarded the fundamental principles of function. These principles involve the consideration of the resilient and like effect of the tissues and the mechanics expressed and formulated in the Laws of Articulation. Only with a full understanding of these laws (possibly intuitive application), combined with skillful execution of purely technical rudiments will teeth ever be set up correctly—correctly as your writer understands it.

It is erroneous to assume that teeth must be truly anatomical in form in order to comply with the requirements of their physical function. Teeth must be anatomical, after the best fashion, so they may serve as a pleasing and respectable substitute for teeth.

A brief outline giving the sequence in which teeth are set up is indicated with other details in Steps 78 to 87.

Anatomical characteristics of the anterior teeth must be more pronounced in outline and shape than those of the posterior teeth, if we accept that the importance of anatomical illusion may decrease towards the distal and lingual as the apparition of the teeth decreases, and that an increased efficiency of the masticatory function is desirable towards the posterior. We may then consider it advantageous to sacrifice anatomical appearance towards the posterior, if thereby an increase of masticatory efficiency is accomplished.

It is of great importance to sound denture prosthesis that porcelain be employed which may be subjected to modification of the masticatory surfaces by wheel and carborundum grinding; this means, that we should have porcelain which does not chip easily during grinding and after being ground can be repolished.

PLANE OF ORIENTATION

The occlusal plane, so-called, is an imaginary plane, commonly accepted through the incisal edges and the cusp summits of the upper cusps. The indiscriminate setting up of the teeth to conform to an occlusal plane or some one other geometrical surface is partly responsible for the many malarticulated dentures found.

The acceptance of a plane or some other characteristic geometrical surface through anatomical landmarks is justified, if used for orientation only. The writer suggests to accept a plane of orientation through the central incisal contact point and the second molar buccal grooves. The difference in inclination of the upper and lower anatomical landmarks mentioned is negligible for the pur-

pose he uses the plane of orientation, namely for signifying the general direction of the masticatory surfaces in the denture space available and for characterization of the compensating curve. The acceptance of this plane of orientation emancipates the operator from the complication which the presence of a curve-of-Spee-like alignment of the teeth may cause, and also permits more comprehensive laws of articulation.

GRINDING OF THE MASTICATORY SURFACES

It is a widespread custom to grind teeth while they are set in wax; two distinct reasons are advanced for grinding them while in wax. Firstly, for the purpose of general reshaping or remodeling of diametrical and axial tooth dimensions to conform to requirements of peculiarities of arch dimensions, tooth alignment and modification of the masticatory surfaces, respectively. Such grinding is done with the carborundum wheel; it is justified wherever indicated. Secondly, the masticatory surfaces of the teeth in wax are frequently ground with carborundum paste in the articulator for the purpose of establishing ideal balanced articulation; exception is taken to this step because:

A change of the form of the seating surface has particularly aggravating consequences upon articulator indications on account of the effect of resilient denture bearing tissues; it sometimes alters the articulator indications in a degree which necessitates reconstruction of a denture. A change of the articulator indications, no matter how slight, invariably demands a rectification of inclined planes of cusps, frequently of the incisal edges.

It, therefore, is evident that meticulous application of carborundum paste grinding of teeth, set up in wax in the articulator, is wholly superfluous in conjunction with extensive vulcanization, incurring changes beyond control.

GRINDING-IN OF THE OCCLUSAL SURFACES

High spots still showing in the mouth or the instrument may have been caused by expansion, shrinkage and

displacement during vulcanization. **They are ground off with the carborundum wheel** and finally with carborundum paste. The grinding with carborundum paste is continued in the articulator until the teeth articulate perfectly.

The dentures are brought into the mouth and articulation is checked. We may find minute interferences, sometimes of an entire region of the masticatory surfaces. Such interferences in a newly made denture may be due to the resiliency of tissues; it is not difficult to correct. Interferences found after a lapse of time are due to alteration of tissues. (See Correction Technique.)

The grinding-in operation requires dental dexterity and an understanding of ordinary mechanics. It is considered inadvisable to rely on so-called machine or automatic grinding attachments to perform this operation, for, firstly, it is wrong in principle, and, secondly, there is nothing gained. Cusp interference must in all cases be eliminated by spot grinding with the carborundum wheel before applying grinding-in with carborundum paste in the articulator. The latter operation consumes very little time (5 to 15 minutes) and requires the operator's constant attention. Only he, through his sense of touch, will be able to grind-in a denture as it should be ground.

THE LAWS OF ARTICULATION

The laws of articulation are purely physical laws which must be observed in the formation of the masticatory surfaces of natural and artificial dentures, whenever it is the aim to establish or produce that function which we accept as balanced articulation. Balanced articulation comprises a continuous change from one balanced occlusion into another for all occluded mandibular excursions.

There are many factors governing the establishment of balanced articulation. Nine of these were given consideration in a paper read before the American Dental Association and published in the Journal of the A. D. A., December 1926. Of the nine factors the five most important in the practice of natural and artificial denture restorations are:

1. The inclination of the condylar guidance.
2. The prominence of the compensating curve.
3. The inclination of the plane of orientation.
4. The inclination of the incisal guidance.
5. The heights of the cusps.

It is evident that the above terms imply the properties of condylar inclination, curve of Spee, incisal guidance and cusp height, which are familiar anatomical conceptions and for which we at times prefer to use the geometrical or mechanical equivalents: Condylar indication, compensating curve, incisal guide and projection of the cusp height.

1. The inclination of the **condylar guidance** or **condyle inclination** is a definite, anatomical conception. The inclination when registered by the intraoral check bite method and transferred to an articulator in conformity with the demands of the intraoral check bite method is not always the geometrical replica of the anatomical inclination, but the equivalent for it in the constrainedly functioning articulator mechanism.

α = Condylar Indication

β = Inclination of the Plane of Orientation

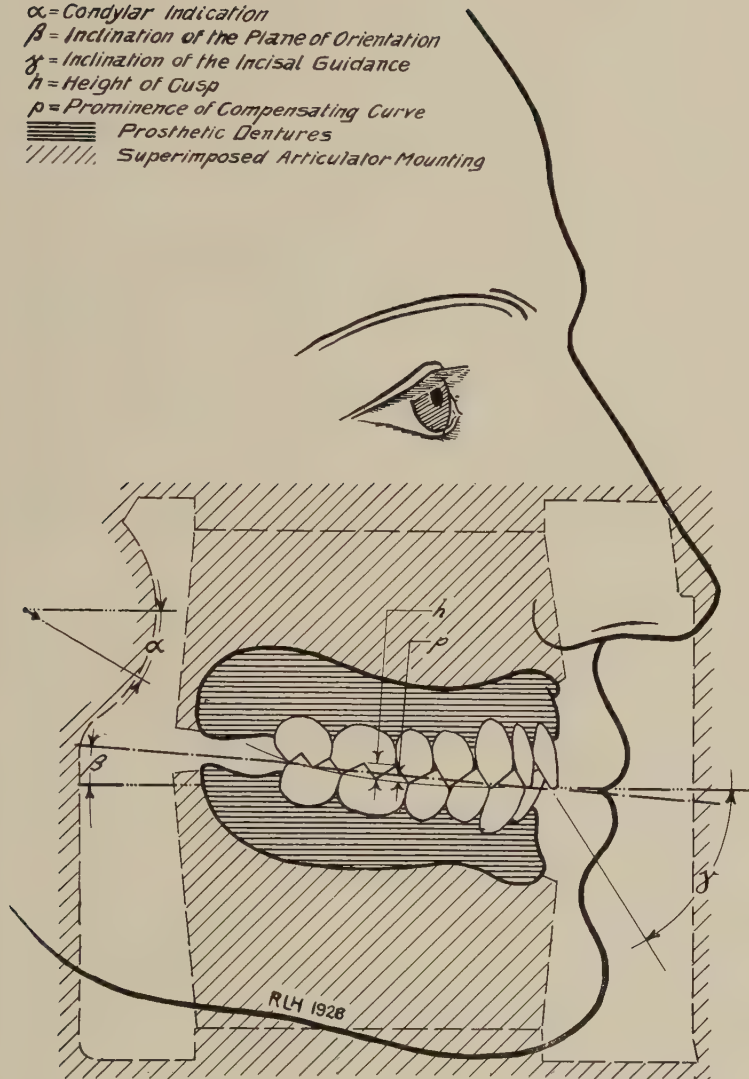
γ = Inclination of the Incisal Guidance

h = Height of Cusp

p = Prominence of Compensating Curve

==== Prosthetic Dentures

///// Superimposed Articulator Mounting



The five main factors governing Articulation, elucidated by a denture mounted in the articulator and inserted in the mouth, both in side projection and superimposed.

This equivalent which we designate as the **condylar indication** is the resultant direction of the components: (1) anatomical condyle inclination and (2) the deviation due to realeff* of the tissues. It is evident that the condyle inclination and the condylar indication have the same angle of inclination only when realeff is absent.

2. The prominence of the **compensating curve** infers an increase of the concavity (sometimes a decrease of the convexity) in the alignment of the mandibular posterior teeth. The maxillary posterior tooth alignment accommodates the curvature of the mandibular alignment, saddling therein.

3. The plane of orientation is a purely geometrical factor. It is a plane assumed to pass through three dental landmarks or points, namely, the central incisal contact point and the summits of the mesiobuccal cusps of the last molars. As the last molars we accept the second molars in deciduous and artificial dentures, and the third molars in complete permanent dentures. The plane may be assumed through the maxillary or the mandibular points. We prefer the plane determined by the maxillary points; it is the most convenient because the determining points are exposed in the mouth, and on the articulator when mounted. The inclination of the plane of orientation is given by the angle it forms to the posterior with the horizontal plane of reference established in the articulator. The horizontal plane of reference establishes itself in the articulator immediately upon mounting the maxillary cast. It is the horizontal plane through the existing (or planned) central incisal contact point of a mounted maxillary denture (or occlusal rim), when the articulator is placed on a table. The selection of this plane makes mandibular measurements facile and gives them a definite comparative value, as soon as we mount the central incisal contact point of each case at the same distance from the articulator base. For this very purpose all Hanau Articulators and Kinoscopes have a groove cut around the incisal pin. It is recommended to mount all

*The term realeff is coined by contracting the beginnings of the words REsiliant And LIke EFFect.

maxillary central incisal contact points on a level with this groove. In addition to this datum we may also record the distance of the incisal contact point from the pin.

4. The inclination of the **incisal guidance** is given by the angle of the lingual surface of the incisors with the horizontal plane of reference. The incisal guidance comprises the hypotenuse of a right angle triangle. The vertical cathetus of this triangle represents the overbite and the horizontal cathetus the overjet. We distinguish a protrusive and lateral incisal guidance.

5. The height of the **cusp** is the projection upon a vertical plane of investigation of the distance between the cusp summit and the imaginary individual cusp base. The acceptance of this distance is closely in keeping with established custom, while the acceptance of its projection upon the vertical plane of investigation is a prelude to the wide scope of application of the laws of articulation.

The change of the cusp height in comparison with the masticatory surface formation as a whole is an auxiliary magnitude. In the establishment of balanced articulation we are primarily interested in the length and the inclination of the effective cusp inclines.

It is very difficult, in fact it is confusing, to convey an understanding of the change of one single factor under the influence of two or more factors changing simultaneously, for these latter may each change in a degree and direction which magnifies, minimizes or nullifies their combined influence upon the single factor. It should not perplex the beginner, that it may be difficult to manipulate one single factor without slightly affecting another factor which in a law is assumed to remain unchanged. The Laws of Articulation are primarily an analysis, a dissection and an explanation of the principles involved in aligning teeth into balanced articulation, and as such are indispensable to the mind which directs the hand.

The method of expressing the reciprocal relation of only two single factors and assuming that the balance of factors involved remain unchanged is a customary procedure. It simplifies the solution and explanation of a problem, without interfering with practical application.

Taking into consideration the above enumerated five factors, each of which may be increased or decreased in its property, it is mathematically possible to express forty relations, or laws in this instance. These forty laws may be divided into ten groups of four each. Each group contains a main law and its three transformations.

With this in mind we present the ten main Laws of Articulation:

1. An increase of the inclination of the **condylar guidance** increases the prominence of the **compensating curve**.
2. An increase of the inclination of the **condylar guidance** increases the inclination of the **plane of orientation**.
3. An increase of the inclination of the **condylar guidance** decreases the inclination of the **incisal guidance**.
4. An increase of the inclination of the **condylar guidance** increases the heights of the **cusps**, progressively toward the posterior.
5. An increase of the prominence of the **compensating curve** decreases the inclination of the **plane of orientation**.
6. An increase of the prominence of the **compensating curve**, increases the inclination of the **incisal guidance**.
7. An increase of the prominence of the **compensating curve** decreases the height of the **cusps**, progressively towards the posterior.
8. An increase of the inclination of the **plane of orientation** increases the inclination of the **incisal guidance**.
9. An increase of the inclination of the **plane of orientation** decreases the heights of the **cusps** equally, or nearly so.
10. An increase of the inclination of the **incisal guidance** increases the heights of the **cusps**, progressively towards the anterior.

To illustrate the meaning of transformations we select the sixth law:

As read in the sector of the compensating curve:*

An increase of the prominence of the compensating curve increases the inclination of the incisal guidance.

And reversed:

A decrease of the prominence of the compensating curve decreases the inclination of the incisal guidance.

As read in the sector of the incisal guidance:

An increase of the inclination of the incisal guidance increases the prominence of the compensating curve.

And reversed:

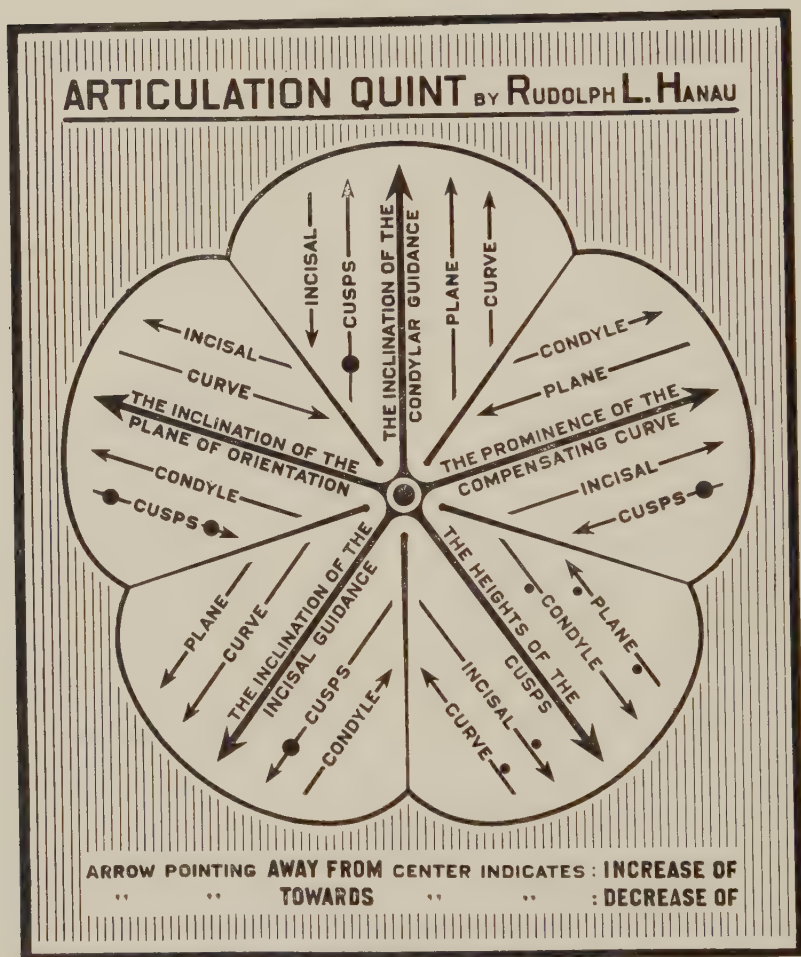
A decrease of the inclination of the incisal guidance decreases the prominence of the compensating curve.

It should always be understood when mentioning a law of articulation, that its transformations also apply.

It will be noted that the main law and its transformations contain the same facts with this difference in formulation: First the influence of an **increase of the prominence of the compensating curve** upon the incisal guidance is given; then the influence of a **decrease** of the prominence of the compensating curve upon the incisal guidance. In both cases the compensating curve was the "active" and the incisal guidance the "passive" factor. In the remaining two transformations we note that the incisal guide is made the active and the compensating curve the passive factors.

*See Quint.

The ten Laws of Articulation are contained in the Quint.



The meaning of the **large arrows** in the middle is given in each sector of the Quint. The four **small arrows**, two on each side of the large middle arrows of each sector, relate the influence or change caused.

All arrows **pointing away** from the center indicate an increase, while those **pointing towards** the center indicate a decrease of the property or character of the indicated factor.

The dot near the head of an arrow indicates: progressively towards the anterior.

The dot near the tail of an arrow indicates: progressively towards the posterior.

Dots near both ends of an arrow indicate: equally or nearly so, antero-posteriorly.

All dots indicate the changes of cusp heights only. They are found on the small cusp arrows with the exception of those in the cusp sector, where they are associated with the other arrows, but their meaning here applies to the large center cusp arrow. The reason for such an expedient is self-evident.

The use of the Quint and the explanation of the symbols used, are elucidated by solving two problems.

1) PROBLEM: What is the influence of the incisal guidance upon the compensating curve, all other factors remaining unchanged?

SOLUTION: Inclination of the Incisal Guidance is marked on the large arrow pointing away from the center, in the lower left sector of the Quint. In the same sector we find a small arrow marked curve, also pointing away from the center. It is understood that "curve" stands for "prominence of the compensating curve," (as is fully indicated by the legend of the middle arrow in the upper right sector.)

Associating the two arrows with their full meaning we arrive at the law:

An increase of the inclination of the incisal guidance increases the prominence of the compensating curve.

2) PROBLEM: What is the influence of the plane of orientation upon the cusp height?

SOLUTION: An increase (the large arrow pointing away from the center) of the inclination of the plane of orientation decreases (the small arrow pointing towards the center) the heights of the cusps equally, or nearly so.

That the heights of the cusps change "equally or nearly so" is indicated by the two heavy dots on the cusp arrow—one near the head and another near the tail end.

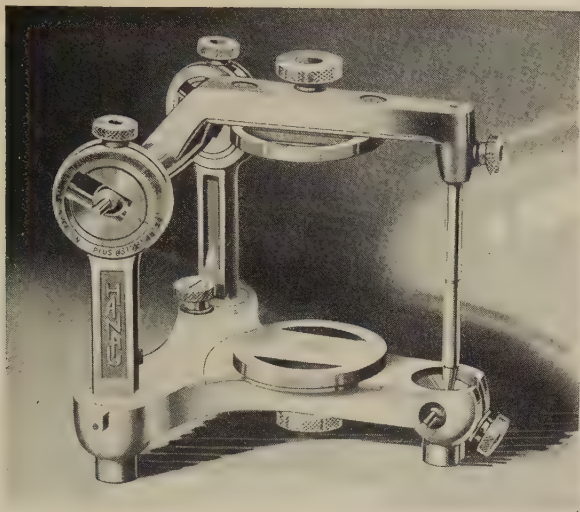
These laws and the Quint were first presented at Louisville (1925). They are not as yet generally

appreciated by the rank and file in the profession, however, we are reliably informed that our most progressive dental colleges have found the laws of articulation worthy of inclusion in their curricula.

The laws of articulation govern the formation of the masticatory surfaces as definitely as the contents of a cube is determined by its width, depth and height.

These laws of articulation not only apply antero-posteriorly to the projection of the masticatory mechanism upon the sagittal plane, but also to projections upon any diagonal, vertical plane bisecting the denture and one condyle fossa.

INTRAORAL TECHNIQUE IN INDIVIDUAL STEPS



Hanau Articulator Model H

Making the Upper Occlusal Rim :

Step 1. Build upper occlusal rim on the upper denture base with softened wax of suitable consistency (or compound) to approximate length and contour in the anterior, allowing 3 to 5 mm excess in height, gradually decreasing to the posterior.

Note: It is important to have the entire bulk of wax of the rim in a plastic condition and that it remain so during Steps 3 and 4.

Step 2. Resoften the closing surface of the upper occlusal rim with a mild flame before placing it in patient's mouth.

Step 3. When the upper is inserted, ascertain that the bulks of wax in the posterior are opposite the ridges, and the approximate fullness of the upper lip becomes evident. If necessary, mould, with the fingers in the mouth, the still soft wax into position.

Step 4. Direct the patient to close in approximate centric relation so that the lower anterior ridge embeds itself in the soft wax rim previously applied (Step 1) to the upper denture base, until the heel of the upper den-

ture base barely touches the lower ridge. Thus an imprint of the remaining lower ridge is made into the wax of the upper occlusal rim.

Note: Such extensive closure will bring the upper ridge crest too far out labially which should be compensated for when trimming. At times it is advisable to cover the mandibular ridge with the lower denture base and to close into it.

Step 5. Remove upper occlusal rim from the mouth and also the lower denture base, if it was inserted.

Step 6. Trim the lingual, labial and buccal surfaces to approximate dimensions.

Step 7. Chill the upper occlusal rim thoroughly.

Step 8. Build up softened wax on lower denture base to approximately the desired height, plus about 2 mm. in the posterior regions and about 3 mm. in the incisal region, and insert the lower occlusal rim, while the wax is still soft throughout.

Step 9. Insert the lower occlusal rim and have the patient close, regardless of pressure applied, into approximate centric relation associated with an opening for the contemplated intermaxillary space for function.

Note: It is practical at this point to have the patient close from one to three mm. in excess, observing that the posterior margins of the denture bases do not touch. Such an excess closing is compensated by the insertion of a separate wax record.

Step 10. Trim and contour all surfaces of the lower to match the corresponding surfaces of the upper occlusal rim.

Step 11. Mark approximate median line and incisal edge line on labial surfaces of the occlusal rims.

Face Bow Record:

Step 12. Prepare upper and lower mounting casts of plaster of Paris.

Note: These mounting casts should not be thick in

order to be convenient for mounting. Both casts must fit the denture bases snug, yet allow convenient removal of both bases with occlusal rims. It is advantageous and saves time at the chair, if these mounting casts were made before the patient is in the chair.

Step 13. Mark locations of condyle centers on both sides of the face upon the skin, about 13 mm ($\frac{1}{2}$ inch) anterior to the auditory openings on lines towards the outer corners of the eyes.

Step 14. The condyle rods a_l and a_r at the ends b_l and b_r of the bow c are adjusted to the proper width by placing their ends over the condyle centers where marked on the patient's face, so that their ends lightly touch the skin.

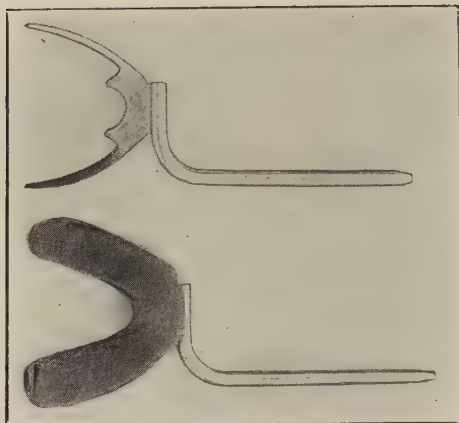


The condyle head centers located. Step 13.
By courtesy of Dr. A. Alfred Nelson, Detroit, Mich.*

Step 15. The bow is now removed from the face and the condyle rods adjusted symmetrically on both sides, using the calibrations on rods a_l and a_r as guides.

Step 16. Insert the lower and upper occlusal rims into the patient's mouth.

*From an article published in Dental Items of Interest, 1925.



The Hanau Bite-fork without and with wax applied to the prongs, ready for the face-bow record. (Note the off-set stem.)

By courtesy of Dr. Harry D. Weller, Indianapolis, Ind.

Step 17. The prongs of the bite-fork are now embedded in a horseshoe shaped mass of softened wax approximately 6 mm. thick at the incisal region and thinning down to approximately 3 mm. at the heels.



The Bite-fork inserted. Step 19.

By courtesy of Dr. A. Alfred Nelson, Detroit, Mich.*

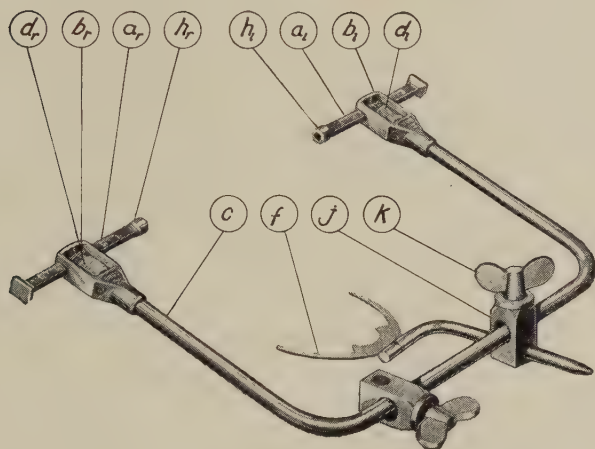
Step 18. The prongs of the bite-fork with the wax still soft are interposed between the occlusal rims in the mouth in such a position that the stem extends forwardly and parallel to the sagittal plane.

*From an article published in Dental Items of Interest, 1925.

Step 19. The stem is held in this position.

Step 20. The patient is directed to close into the softened wax on the bite-fork until both rims are imbedded sufficiently to hold the bite-fork in position.

Note: No attention need to be given to the relation of the mandible to the maxillae, when making this registration.



- a_l and a_r = left and right condyle rods
- b_l and b_r = left and right ends of bow
- c = bow
- d_l and d_r = left and right locks of condyle rods
- f = bitefork
- h_l and h_r = left and right terminals of condyle rods
- j = clamp
- k = wing nut of clamp

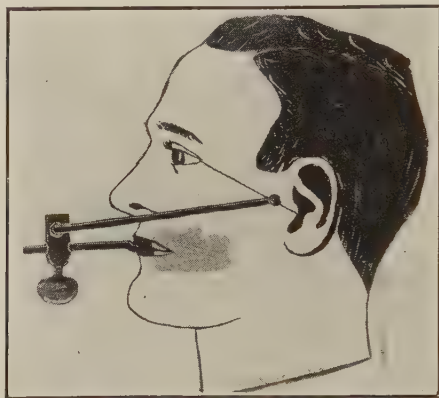
Step 21. Draw bow c over face allowing the extending stem of the bite-fork to enter the clamp, and position terminal h_l and h_r over the marked condyle center locations.

Step 22. Holding the bow in position have clamp j securely locked by applying wing nut k .

Step 23. Check, and if necessary readjust terminals, so that they just touch the skin over the marked condyle centers and lock them in position by applying nuts d_l and d_r , respectively.

Note: Asymmetrical setting of the condyle rods a_l

and a_r within the range of accommodating the articulator width has no bearing with this Articulator Technique upon the registration, provided the expedient given in Note of Step 27 is carried out.



The Face-bow clamped in position, Step 22.
By courtesy of Dr. A. Alfred Nelson, Detroit, Mich.*

Preparing the Articulator and the Face Bow for Mounting:

Step 24. After ascertaining that all adjustments are securely locked, remove face-bow with bite-fork and keep it undisturbed for the transfer to the instrument.

Step 25. Remove both occlusal rims from the mouth.

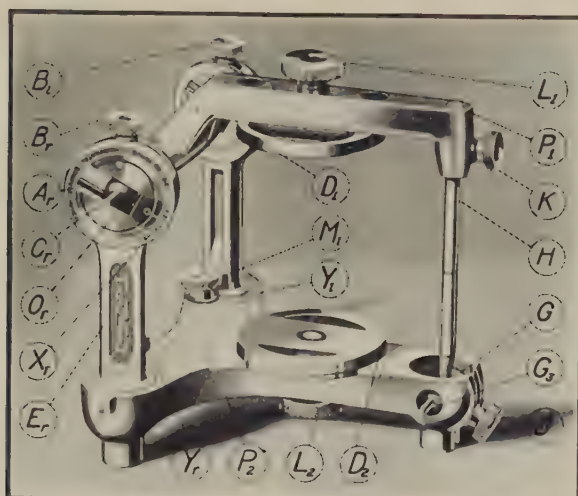
Step 26. Before mounting the upper cast, the articulator is tentatively set as follows:

- (1) Set calibration X_l on the left and X_r on the right to read 30° .
- (2) Set calibration Y_l on the left and Y_r on the right to read 15° .
- (3) Lock the incisal guide in a steep inclined position.
- (4) Set incisal pin H flush at top with the upper surface of the upper jaw member and then insert incisal pin extension.

*From an article published in Dental Items of Interest, 1925.

5. Oil or vaseline is applied to the frame where plaster is to be built up. Soap stone powder is equally serviceable.
6. A mounting plate is attached to each jaw member and held in place by screws.

Note: Lock all nuts by hand, using no undue force nor pliers.

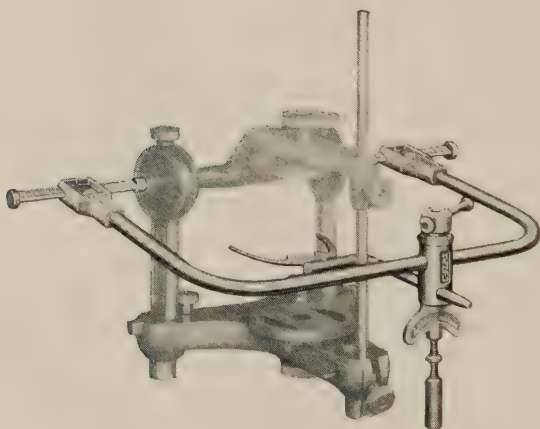


- A_l and A_r = left and right condylar guide slots
 B_l and B_r = locknuts for left and right condylar slot adjustments
 C_l and C_r = left and right terminals of condylar shaft
 D_1 and D_2 = upper and lower mounting plates
 E_l and E_r = left and right condylar posts
 G = incisal guide
 G_2 = handle for incisal guide
 H = incisal pin
 J = locknut for incisal guide adjustment
 K = lockscrew for incisal pin
 L_1 and L_2 = lockscrews for upper and lower mounting plates
 M_l and M_r = locknuts for left and right lateral adjustments
 O_l and O_r = left and right condyle elements
 P_1 and P_2 = upper and lower jaw members
 X_l and X_r = left and right calibrations for antero-posterior condylar indications
 Y_l and Y_r = left and right calibrations for lateral indications

Face Bow Mounting:

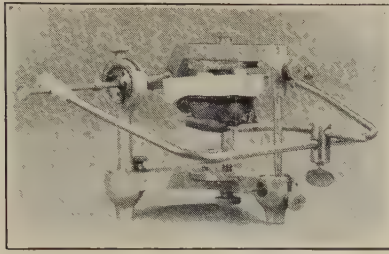
Step 27. Set sliding condyle rods a_l and a_r at the bow ends b_l and b_r of the face bow c symmetrically on both sides, until the bow gently springs over the articulator condyle shaft, provided they were adjusted symmetrically on the patient.

Note: For asymmetrical setting, which may have occurred during operation No. 23, the rods are shifted equidistally in opposite directions until the bow gently springs over the articulator condyle shaft. Adjustment of the condyle rods is facilitated by turning the upper member of the articulator back, or turning the articulator around, to avoid possibilities of unsetting the face bow record.



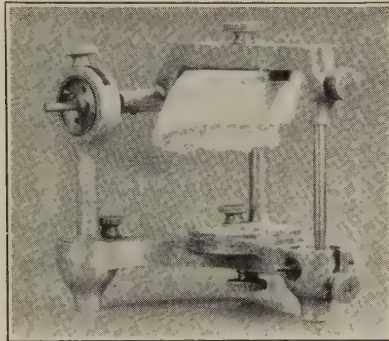
The Face-Bow Style C and bite-fork in place, ready for mounting the upper occlusal rim and upper mounting cast; the latter two are omitted to allow an unobstructed view. Note that the clamp is provided with an adjustable jack to support the face-bow in a desired position. The Hanau Face-Bow Style C is recommended and generally preferred because it makes application most convenient.

Step 28. Insert upper occlusal rim, with the upper mounting cast placed therein, into the wax record on the bite-fork.



The Hanau Face-bow and Bite-fork with upper occlusal rim and upper mounting cast inserted, in position ready for mounting in the articulator with plaster of Paris.

By courtesy of Dr. Russell W. Tench, New York City.*



The upper cast mounted.

By courtesy of Dr. Russell W. Tench, New York City.*

Step 29. With the condyle rod ends in position, raise or lower the face bow on the instrument until the accepted incisal edge line is approximately on a level with the groove marked around the incisal pin.

Step 30. Support face-bow securely in proper position for mounting.

Note: Hanau Face-Bow Style A is supported by a soft wire from the upper jaw member, or retained otherwise.

*From an article published in the Journal of the American Dental Laboratories Association, 1926.

Hanau Face-Bow Style B utilizes a second clamp into which a supporting rod is inserted.

Hanau Face-Bow Style C employs a clamp and jack device which permits adjustment and support.

Step 31. Apply plaster on top of mounting cast, after the upper jaw member of the instrument has been carefully swung back, and while the plaster on top of the cast is still of a creamy consistency, swing the upper jaw member forward until the incisal pin is stopped at the guide. Thus the mounting plate, previously attached to the upper jaw member, is imbedded in the still soft plaster. Complete the mounting with a spatula and remove all excess plaster extending above the mounting plate.

Note: Avoid displacing the occlusal rims and casts and do not at any time during the face bow mounting apply undue forces which may upset the face bow adjustments. It is well to interpose a support between the wax covered prongs of the bite-fork and the lower jaw member, in addition to supporting the bow as described in Step 30.

Step 32. After the plaster hardens, remove the face bow and the upper occlusal rim from the articulator and if necessary trim the mounting, removing it temporarily from the articulator.

Centric Relation Record:

Step 33. Apply a dust of soap stone powder with a soft brush, or a film of vaseline, to the recording surfaces of both occlusal rims to prevent sticking.

Step 34. Insert the upper occlusal rim into the mouth.

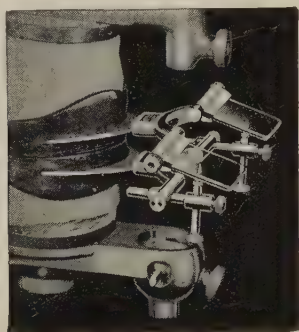
Step 35. Insert the lower occlusal rim upon which has been spread and luted a suitably shaped recording material such as wax. Have it 2 to 3 mm. thick, and softened throughout.

Step 36. Direct the patient to close to the desired jaw relation in a retruded rest position (unstrained centric relation, the condyle heads resting gently in their sockets).

Note: The recording material should not be perforated at any point.

Step 37. The accuracy of the centric relation rest record is determined by having the patient slightly open and slowly close into the chilled recording material. Upon closing, the entire recording surface must meet at all areas simultaneously, and the occlusal rims must not be displaced. Check by visual and digital examination and by interpreting the patient's perceptibility of contact distribution upon closing.

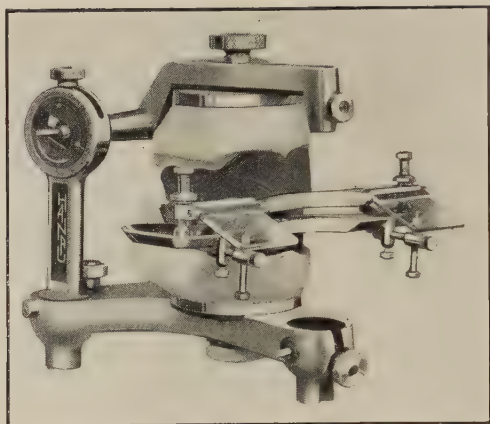
Note: The arrow-point-tracing may profitably be applied in conjunction with the other determinants; but, it does not suffice alone. It serves as a check of centric jaw relation without particular regard to the pressure applied in registration. For this purpose the Sears Duplex Tracer or the Sears Trivet is highly recommended.



Duplex Tracer shown on Model H

Step 38. High spots on the recording surfaces detected by the patient or the operator, may be reduced by reheating locally with a heated spatula or a small flame. When areas fail to make contact, they should be built up. At times it is advisable to do both, until an even contact distribution is accomplished and the rims register accurately.

Note: It is advisable that the beginner make an entire new record, if inequality of the recording surfaces is found. The more experienced may proceed to correct inequality by the above described method.



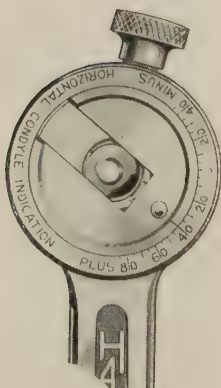
Trivet shown on Model H

Step 39. The occlusal rims with the centric relation rest record are carefully removed from the mouth.

Mounting the Lower Mounting Cast in Centric Relation:

Step 40. The centric relation rest record is accurately registered in the articulator between the upper and lower occlusal rims (the latter having the lower mounting cast inserted) and secured in place.

Note: The articulator still remains set as given in (26). It is of utmost importance that the "condylar elements" rest against their stops, while mounting the lower mounting cast in centric relation.



In the accompanying illustration the horizontal condylar adjustment is set at plus 40° on the calibration. Note the escutcheon head being at the back end of the indicating line, facilitates reading the indication on the calibration.

The condyle elements O_l and O_r rest against the stops, which are their correct position in centric relation. The lower cast is mounted in centric relation, with the condyle elements in these positions only—irrespective of the horizontal condyle indication. The beginner may resort to a weak rubber band of about one square millimeter in cross section, or a centric stop made especially for the purpose to reduce the movement of the upper jaw member to a mere hinge movement.

Step 41. Plaster of Paris is applied to mount the lower mounting cast to the lower mounting plate, previously (26) attached to the lower jaw member.

Checking Centric Relation Rest Record:

Step 42. A centric relation record is now made in the instrument.

Note: Observe that the "condylar elements" rest against their stops.

Step 43. Trim the labial and buccal borders of this record carefully with a sharp knife, so that the recording edges of preferably the upper recording surfaces are clearly exposed to view.

Step 44. This record (43) is checked in the mouth (37), and if found faulty, corrected (38) by remounting the lower (39, 40, 41, 42) and rechecked (43).

Note: The application of the Sears Duplex Tracer or the Sears Trivet which give two arrow-point tracings, is recommended for checking centric relation. The coincidence of the scribe points with the apices of the arrow tracings indicates that the mandible is in centric relation. However, it is urged to reverse the procedure introduced by Gysi. It is recommended to first make the arrow-point tracing in the articulator for the purpose of checking it on the patient.

Step 45. Mark definitely the median and incisal edge lines on labial surfaces of occlusal rims.

Protrusive Relation Registration:

Step 46. Apply a dust of soap stone powder with a soft brush, or a film of vaseline to the recording surfaces of both occlusal rims to prevent sticking.

Step 47. Insert the upper occlusal rim in the mouth.

Step 48. Insert the lower occlusal rim upon which has been spread and luted a suitably shaped recording material such as wax. Have it 2 to 4 mm. thick, and softened throughout.

Note: Often it is more convenient to insert first the lower and then the upper; undue lapse of time will cause premature chilling of the wax.

Step 49. Direct the patient to close into the soft wax with the mandible in protruded relation, approximately 6 mm ($\frac{1}{4}$ inch) anterior to centric relation with an opening relation approximating that of the accepted centric relation.

Step 50. Ascertain that an accurate protrusive relation rest record is taken by having the patient slightly open and slowly close into the protrusive relation record. Upon closing, the entire recording surfaces must meet at all areas simultaneously and the occlusal rims must not be displaced. Check by visual and digital examination and by interpretation of the patient's perceptibility of the contact distribution upon closing.

Step 51. High spots on the recording surfaces, detected by the patient or the operator, may be reduced by reheating locally with a heated spatula or a small flame. When areas fail to make contact, they should be built up. At times it is advisable to do both, until an even contact distribution is accomplished and the rims register accurately.

Step 52. The occlusal rims with the protrusive relation rest record are carefully removed from the mouth.

Adjustment of the Horizontal Condylar Indication:

(Hanau Articulator Model H)

Step 53. The upper and lower occlusal rims are placed in their respective mounting casts in the instrument, while the upper jaw member of the instrument was swung back. The incisal pin had been disengaged by raising it about one-half inch off the incisal guide.

Step 54. The protrusive relation rest record is accurately fitted upon the lower occlusal rim.

Step 55. The horizontal condylar adjustments are freed by releasing locknuts B_l and B_r .

Step 56. The upper occlusal rim, securely seated in the mounting cast, is accurately registered in the record.

Step 57. Examine excursions of the "condylar elements" to see that they are about 6 mm.

Note: The magnitude of the condylar excursions is evident from the spaces between the "condylar elements" and their stops. A protruded lateral relation, instead of a truly protruded relation, is frequently registered by the patient. If the excursions of the "condylar elements" on both sides exceed 4 mm, but are still **within** the range of the "condylar slots," then the record may still be used at this stage of the technique. At times the patient fails to register a true protrusive or even an acceptable protruded lateral rest record. In such event, lateral relation rest records are used to adjust the horizontal condylar indications on the balancing sides of the respective lateral relation.

Step 58. The condylar slots A_l and A_r are adjusted by carefully using the locknuts B_l and B_r as handles until both occlusal rims register accurately in the record.

Note: First manipulate one side, then the other and check both again, alternately. An accurate seating must be secured without forcing, so that the recording surfaces are not mutilated. In the end accurate registration must be obtained without mutilation of the record.

Step 59. Locknuts B_l and B_r are locked by hand without using force nor pliers, while the occlusal rims register accurately in the record.

Checking Protrusive Relation Record:

Step 60. A protrusive relation record with "condylar element" excursions of approximately 6 mm (5 to $6\frac{1}{2}$ mm) is now made in the articulator.

Note: It is suggested that the inexperienced operator temporarily set the posts E_l and E_r to read 0° on calibrations Y_l and Y_r , respectively, in order to secure a straight protruded excursion. The operator may interpose wooden or rubber (not metal) blocks of 6 mm ($\frac{1}{4}$ inch) thickness

between the condylar elements and their stops, in order to secure the desired excursions.

Step 61. Trim the labial and buccal surfaces of this record carefully with a sharp knife, so that the recording edges of preferably the upper recording surfaces are clearly exposed to view.

Step 62. This record (61) is checked in the mouth (50), if found faulty, corrected (51), the "condylar slots" of the instrument readjusted (52 to 59), and rechecked in the mouth (50).

Step 63. A written record of the right and left condylar indications, obtained with the checked protruded record, is made for later reference.

Lateral Condylar Post Indication:

The following method is employed to arrive at acceptable lateral indications: The reading of the horizontal indication on graduation X without regard to minus or plus is taken, divided by eight, and twelve added. The result gives the setting for the lateral indication, which is read on graduation Y at the base.

Examples:

The horizontal condylar indication on the left side reads **plus** 40°, then the **left** lateral indication is arrived at as follows:

40 divided by 8 equals 5, and

5 plus 12 equals 17, therefore

the **left** lateral condylar indication is 17°.

The horizontal indication on the **right** side reads minus 24°. The minus is disregarded. Then the **right** lateral indication is arrived at as follows:

24 divided by 8 equals 3, and

3 plus 12 equals 15, therefore

the **right** lateral condylar indication is 15°.

Adjustment of the Lateral Condylar Post Indication:

Step 64: Take left condylar indication on graduation X₁ (disregard plus or minus). divide by eight and add twelve.

Step 65. Swing post E_l (on left side) into position to read the computed angle on graduation Y_l .

Step 66. Take right condylar indication on graduation X_r (disregard plus or minus), divide by eight and add twelve.

Step. 67. Swing post E_r (on right side) into position to read the computed angle on graduation Y_r .

Step. 68. Locknuts M_l and M_r at the bases of the posts are locked by hand without using force nor pliers.

Checking Lateral Relation Records:

Step 69. A left lateral relation record with a condylar element excursion of approximately 6 mm. (5 to 6½ mm.) on the balancing side is made in the instrument.

Note: Observe that the condylar shaft on the working (left) side makes a lateral excursion while the condylar element remains against the stop; if necessary, push shaft gently with the thumb towards the balancing (right) side.

Step 70. Trim the labial and buccal surfaces of this record carefully with a sharp knife, so that the edges of preferably the upper recording surfaces are clearly exposed to view.

Step 71. This record (70) is checked in the mouth (50), if found faulty, corrected (similarly as in 51), the condyle slots of the articulator readjusted (similarly as in 52 to 59) and rechecked in the mouth.

Step 72. A right lateral relation record with a condylar element excursion of approximately 6 mm. (5 to 5½ mm.) on the balancing side is now made in the articulator, analogous to Steps 70 and 71.

Step 73. A written record of the left and right horizontal condylar indications obtained with the checked records (71, 72) is made for later reference.

Step 74. The left and right horizontal condylar indications as recorded (63) are re-established in the articulator, which is now ready for giving consideration to the incisal guide and setting up the teeth.

Adjustment of Standard Incisal Guide:

- Step 75.** Adjust antero-posterior indication of the incisal guide to conform to the mechanical requirements of both condylar indications.
- Step 76.** Adjust lateral indication of the incisal guide to comply with the difference between the individual condylar indications by manipulating the sidewardly extending handle.
- Step 77.** Hold guide in position with this handle and lock locknut "J" without using force nor pliers.
- Step 78.** The accepted centric relation is opened about 1 mm between the anterior portion of the ridges to allow for grinding, by setting the incisal pin.
- Step 79.** The six upper and six lower anterior teeth are preliminarily set up to the accepted incisal edge line with consideration of esthetics, ridge position and chosen incisal guidance.
- Step 80.** The occlusal rims with the preliminary set-up of the anterior teeth are inserted in the mouth of the patient, checked for esthetics, and phonetics if possible, and modified if necessary.

Re-adjustment of Incisal Guide:

- Step 81.** Re-adjust the incisal guide to harmonize with the accepted guidance of the anterior teeth.

Note: The adjustment is readily checked by observing that the incisal pin is guided on the incisal guide, while the anterior teeth articulate. The expedient of tracing, with the incisal pin, an incisal guide into compound is advised in cases where the condylar indications are very flat (negative) and also in partial denture construction.

Setting-up of the Teeth:

Efficient function of the teeth is achieved by establishing balanced occlusions during articulation, which means balanced articulation.

Balanced articulation is secured by the position and alignment of the teeth and the formation of the masticatory surfaces as governed by the patient's individual

anatomy and his natural or acquired habits. However, this is not all.

The arrangement of the teeth and the selected formation of the masticatory surfaces have a reciprocal influence upon each other. This influence is formulated in the "Laws of Articulation," see page 28.

Step 82. The set-up in wax of the entire masticatory surfaces into occlusions and articulation is completed in the articulator, the denture space being the prime guiding factor. Esthetics, phonetics, statics and articulation are checked in the mouth by observations and records.

Step 83. Should protrusive interference be observed in the mouth, then re-adjust the horizontal condylar indications to reproduce in the articulator the error observed in the mouth, either by means of protrusive records or, if the operator is experienced, he will be able to do so by sight and interpretation.

Step 84. Should lateral interference be observed in the mouth, then lateral relation records are taken by interposing a strip of soft wax between the masticatory surfaces on the balancing side **in the articulator** (69, 70), and while soft, corrected in the mouth, and the lateral indication readjusted to conform to the corrected record.

Note: The left lateral relation record was used to re-adjust the lateral indication on the right side, by rotating post E_r , on the right. The right lateral record served to adjust the left lateral indication by rotating post E_l on the left.

Preliminary Grinding of the Masticatory Surfaces, Etc.:

The Articulator, when readjusted, shows the cusp interferences observed in the mouth. For technical reasons, a degree of over-retrusion of the masticatory surfaces on the working side in lateral should be observed in the articulator, if a true lateral relation record made in the mouth were inserted. This over-retrusion becomes very evident when a strained lateral record was made in the mouth.

Step 85. Interfering cusps in centric relation are corrected by applying the carborundum wheel, preferably by deepening the sulci. Interference in lateral or protrusive is eliminated by grinding with the wheel one or both interfering, opposed cusp inclines or, if the interference is minute, by grinding in the articulator from the respective occlusion into centric occlusion.

Step 86. The gums are carved after having the teeth in satisfactory occlusion and articulation with the desired esthetic and phonetic effect.

Step 87. The teeth set up in wax, with the gums carved, are finally checked back in the articulator before being vulcanized, to ascertain that proper function has not been disturbed. All articulator adjustments are recorded for later reference.

Remounting Record:

In order to eliminate the necessity of making a new face bow record and transfer, a remounting record is prepared, if the original mounting casts were not preserved on their mounting plates.

Step 88. Remove the lower mounting plate with the lower cast and use a new mounting plate.

Step 89. Apply dust of soapstone powder with a soft brush, or a film of vaseline, or cover the occluding surfaces of the upper denture snugly with No. 60 or thinner tin foil to prevent sticking of the plaster.

Step 90. Build up plaster of Paris, just high enough to allow an impression of the occluding surfaces of the upper teeth.

Step 91. Swing the upper articulator jaw member with the upper denture attached, into the still soft plaster in centric relation.

Step 92. When the plaster is about to set, remove upper articulator jaw member with cast and denture attached carefully, lifting it off its seating in the plaster.

Vulcanization, Etc.:

Step 93. The dentures are vulcanized in approved manner, which presupposes careful flasking, packing and finishing.

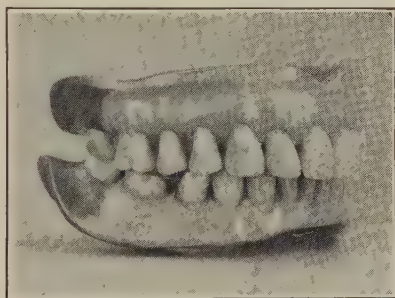
Remounting:

It was customary to make a special remounting record as given in steps 88, 89, 90, 91 and 92. In such a case the mounting of the upper denture is almost identical to the technique to be given for using the preserved, original mounting casts prepared in step 12. We shall only describe the remounting with these.

Remounting of the Upper Denture:

Step 94. Prepare new upper and lower mounting casts for the fully vulcanized dentures (as in 12).

Step 95. Establish a new centric relation rest record in the mouth, as in 33, to 39.



A finished set of vulcanite dentures before grinding, with a newly established centric relation rest record interposed.

By courtesy of Dr. Russell W. Tench, New York City.*

Step 96. Place the lower denture upon the original mounting cast, if necessary trim same to compensate for slight changes during vulcanization, so that the lower is seated securely.

Step 97. Place upper denture with upper mounting cast

*From an article published in the Journal of the American Dental Laboratories Association, 1926.

(94) inserted, upon the lower with the centric relation record taken in 95.

Step 98. Mount the upper as given in steps 31 and 32.

Note: Steps 94 to 98 are equivalent to the face bow mounting.

Step 99. Retain lower denture in centric relation record (established in 95) in the articulator. Remove the lower mounting cast and mounting plate, and insert a new mounting plate.

Step 100. Insert the new mounting cast in the lower denture and mount same as in 40 and 41.

Re-checking Articulation of the Finished Dentures:

Step 101. The articulator adjustments are set as recorded in step 87. Articulator records are made, rechecked in the mouth, and if necessary the articulator is readjusted as was done before. The incisal pin should be disengaged by clearing the guide.

Step 102. Determine high spots in the articulator and corroborate in the mouth.

Step 103. Grind-off cusp inclines with the carborundum wheel to conform to requirements of accepted occlusions and articulation.

Step 104. Apply carborundum paste to the occluding surfaces.

Step 105. Apply articulator grinding alternating approximately as follows:

1. Twenty strokes from left lateral into centric occlusion,
2. Twenty strokes from right lateral into centric occlusion,
3. Twenty strokes from protrusion into centric occlusion.

Note: Repeat this order of grinding, giving extra grinding where necessary, but do not grind indiscriminately. Wherever undue cusp interference becomes evident it should be touched with the carborundum wheel.

Observe that condylar shaft is held against the condylar element on the balancing side. This is conveniently done by gently pressing the thumb against the end of the condylar shaft on the working side, while executing lateral grinding.

Step 106. Polish occluding and adjacent surfaces of the teeth with mud of pumice-stone applied, as is customary, to a cloth wheel and felt cone.

CORRECTION TECHNIQUE

It is assumed that mandibular registrations and records were made and the dentures (or their equivalent) were mounted in the adjusted instrument.

The rectification of the occluding surfaces applies to teeth set up in wax, to just completed dentures as well as to dentures already used. The limitations for grinding down of the occluding surfaces, so they may articulate in balance, are given by the amount of tooth material available for sacrifice. New dentures properly made should always be correctable.

The following **rectification technique** applies to both cases; yet it must be mentioned, that **the limitations for corrections are given by the amount of tooth material available for sacrifice.**

RECTIFICATION OF THE OCCLUDING SURFACES OF DENTURES

Phase A:

- (a) Centric occlusion of the masticatory surfaces is corrected by wheel grinding, in some instances by re-basing or both as circumstances may warrant. If the teeth are set up in wax only, then realigning should always be considered first.
- (b) **Elimination of interference in lateral and protrusive occlusions of the masticatory surfaces.**

The teeth set up in wax may again be reset, ground with the wheel and occasionally ground with carborundum paste in the articulator. Of course, the maintenance of centric relation of the jaws is observed.

After vulcanization correction by wheel and carborundum paste grinding only is possible.

Phase B:

To eliminate interference observed or registered in the mouth:

In the entire incisal region, in protrusion or in lateral occlusion.

In the left incisal region, in protrusion or in lateral occlusion.

In the right incisal region, in protrusion or in lateral occlusion.

In the molar regions (both sides) in protrusion or in lateral occlusion.

In the molar region **right side.**

In the molar region **left side.**

Laterally in the **posterior** region.

Laterally in the **anterior** region.

Readjust the articulator as follows:

Increase the horizontal inclinations equally on both sides, about 5° at a time, and grind until the interference is eliminated.

Increase horizontal inclination on the right more than on the left, for instance 10° on the right and 5° on left.

Increase horizontal inclination on the left more than on the right side.

Decrease horizontal inclinations equally on both sides, about 5° at a time.

Decrease horizontal inclination on the right side and increase on the left side until it bears on the right molar region only.

Decrease horizontal inclination on the left side and increase on the right until it bears on the left molar region only.

Increase lateral inclination in order to increase the respective relative lateral component movement in the posterior part, or decrease the lateral inclination in order to decrease the respective relative lateral component movement in the posterior part.

Decrease lateral inclination in order to increase the respective relative lateral component movement in the anterior part, or increase the lateral inclination in order to decrease the respective relative lateral component movement in the anterior part.

REVISED TERMINOLOGY (1929)

It is realized that this chapter represents but a fraction of what would clarify a state of confusion which not so long ago seemed desperate.

Nomenclature is still incomplete. Many terms, definitions and formulations in Denture Prosthesis recommended by me during the past few years, seemed to have been a happy choice, for their application has brought about a considerable improvement in clearness of expression and interpretation, as is noticeable from recent Dental Literature. However, much more has to be done.

At times—and it occurred quite frequently—I have been accused by “specialists” of having applied too technical a language in my presentations, and of expecting too much of the “average dentist.” Now, as a matter of fact, I will have to admit, that as a whole I experienced less difficulties with the “average” than with those critics who placed the average far below themselves. However, there is something more serious to criticize on my early writings, namely, that they by no means clearly convey my thoughts. And that is so, because I obligingly used as much as possible of the dental vernacular in vogue, not fully realizing that it was saturated with confused terms. This is an effort to bring about further improvements in dental terminology.

In the following is given a compilation of a few anatomical and techno-mechanical equivalents, and an extract of a talk given before students. It is submitted to prove that it may be well worth the while to make a sharp distinction between purely anatomical and techno-mechanical terms. The terms enumerated in the list are applied in the extract.

LIST:

ANATOMICAL AND TECHNO-MECHANICAL EQUIVALENTS AND NEAR-EQUIVALENTS

Anatomical	Techno-mechanical
patient	manikin
masticatory apparatus	articulator; kinoscope
jaws	jaw members
maxillae	upper jaw member
mandible	lower jaw member
supporting tissue areas	denture seat on cast
alveolar ridges and palate.....	cast model; mounting cast
natural dentures	prosthetic dentures; restorations
masticatory surfaces.....	occlusal surfaces of artificial teeth
occlusal surfaces.....	closing surfaces of occlusal rims or records.
anatomical guidance	mechanical guide; articulator guide
condyle inclination	condylar indication
condyle path; glenoid fossa.....	condylar slot
condyle guidance	condylar guide
condyle head	condylar element
condyle axis	condylar shaft
condyle socket	centric relation stop
incisal guidance	incisal guide
mouth record	articulator record
maxillo-mandibular function	articulator function
natural teeth	artificial teeth
mandibular movements.....	articulator movements

EXTRACT:

The Arts and Sciences of Full Denture Prosthesis are applied in the making of **prosthetic dentures** which are to replace **natural dentures**. Methods and operations applied in dental institutions are demonstrated to students on **manikins**, which are instruments contoured to resemble the masticatory apparatus; they simulate the execution of **maxillo-mandibular function**. In such form a **manikin** will serve well as a substitute for a **patient**. In the majority of cases, the prosthetist is confronted with an **edentulous mouth**; his problem consists of constructing an artificial substitute which functions, and restores or improves appearance.

A prosthetic denture comprises **artificial teeth** aligned over and securely made integral with a **denture base** of

suitable material. To accomplish the technical end a prosthetist must be versed in technique, instruments and materials, for after all, a good set of dentures is a feat of **engineering in small space**. And, if it is good modern engineering, then the artistic effect of the construction has not been neglected.

Many instruments, devices and materials are used in denture construction.

To begin with, the dentist surveys or, as he puts it, makes impressions of those areas of the oral cavity, which are to be utilized for supporting tissue areas. Upon these must ultimately function a set of prosthetic dentures with well adapted **seating areas**. As an intermediate between impression and vulcanized dentures, we will have to mention that a true replica of the **tissue supporting areas** had to be prepared from the impressions, namely, a **model cast** usually made of hard setting, resistive plaster or artificial stone. For mounting vulcanized dentures at a later stage, similar casts are required; these, known as **mounting casts**, need not be very durable and are therefore made of ordinary plaster of Paris.

Wax or compound walls are built upon denture bases to form an upper and a lower occlusal rim. These we may consider dummy dentures with which we estimate and gauge the **denture space** and which are also used in registering, recording and mounting. At the chair and in the laboratory a manikin would be a cumbersome appliance. There, an adjustable articulator serves best; for very exacting investigations the kinoscope, which is a precisely adjustable articulator, is in order. An **articulator** or a **kinoscope** is the techno-mechanical equivalent of the **masticatory apparatus**; the instruments are adjusted with **mouth records** and the adjustments are checked by **articulator records** verified in the mouth.

An articulator comprises an **upper** and a **lower jaw member**, representing the **maxillae** and the **mandible**. The coaction of the **jaw members** is satisfactory, if the articulator **guides** are adjusted, not necessarily in angular conformity with the anatomical guidances, but so that they

become their equivalent for function. The **condylar shaft** of the Articulator is the mechanical realization of the imaginary **condyle axis** through accepted **condyle head centers**. This **condylar shaft** can rotate and slide in spherical **condylar elements**. The condylar elements in turn are slideably and rotatably engaged in adjustable **condylar slots**. The freedom of movement of these parts in coaction is equivalent to the functional excursions of the **condyle heads** from the **condyle sockets** over the **condyle paths** of the **glenoid fossae**. The **incisal guidance** is accepted as the third **anatomical guidance**; in the articulator we have the **incisal guide** for it.

The scope of practical application of an articulator is given by the range of adjustments of the articulator guides, by anatomical, physiological and mechanical requirements and by special demands of restorations.

TERMINOLOGY:

Abbreviations:

	Occlusion	Relation	Record
Rest		R. R.	R. R. R.
Retrusive	R. O.		
Centric	C. O.	C. R.	C. R. R.
Protrusive	P. O.	P. R.	P. R. R.
Lateral	L. O.	L. R.	L. R. R.
Protruded lateral	P. L. O.	P. L. R.	P. L. R. R.

A. E. = Anatomical equivalent.

T. M. E. = Techno-mechanical equivalent.

Adaptation is conformity of the seating surfaces and attachments of a restoration to the supporting surfaces.

Anatomical Articulation infers the articulation of natural dentures in the mouth.

Anatomical Guidances of the masticatory apparatus are the glenoid fossae and articulating cusp inclines of natural and restored teeth.

Anatomical Records are the records of anatomical positions, landmarks, outlines, aspects or forms which exist or are contemplated in restoration.

Articulation in dentistry implies function; it is the change from one occlusion to another occlusion, while the masticatory surfaces maintain contact.

ARTICULATION see:

- Anatomical Articulation
- Balanced Articulation
- Balanced Anatomical Articulation
- Balanced Prosthetic Articulation
- Balanced Semi-Prosthetic Articulation
- Mal-Articulation
- Mixed Articulation
- Natural Articulation
- Ordinary Articulation
- Prosthetic Articulation
- Semi-Prosthetic Articulation
- Strained Articulation
- Unbalanced Articulation
- Unnatural Articulation
- Unstrained Articulation

Articulator: An adjustable articulator is a dental instrument which serves as a dummy masticatory apparatus in construction of a restoration for a patient. To serve effectively, the mechanical guides of the instrument are adjusted to conform to the functional requirements of the individual case.

Articulator Guides are guiding elements of articulator and similar instruments; they are the T. M. E. of anatomical guidances.

Articulator Movement. As a rule only direction and magnitude of movements of points which represent analogous points in the anatomy are considered.

Articulator Record is a record obtained by a registration in an articulator or similar instrument. Articulator records are verified in the mouth for the purpose of checking articulator mountings and adjustments.

Artificial Teeth are elements made of porcelain or other suitable material; they substitute the visible part of the tooth crowns and are provided with means for attachment.

Balanced Anatomical Articulation is a change from one balanced occlusion of natural dentures associated with an analogous jaw relation, into other corresponding associations, while the masticatory surfaces remain in contact.

It has been claimed by some that a natural denture balanced throughout its effective masticatory range is the normal, if centric occlusion of the masticatory surfaces is associated with protrusive relation of the jaws. That may be so. It has not been convincingly demonstrated to your writer, though it is conceded that the mandible is able to carry the masticatory surfaces into a retruded position under strain.

Balanced Articulation is the change from one balanced occlusion to another, while the masticatory surfaces remain in balanced contact. Balanced articulation complies with accepted laws of articulation.

Balanced Occlusion is a contact relation of the masticatory surfaces having contact at widely distributed single or multiple contact points, or contact areas, thus tending to maintain equilibrium of the dentures.

The necessity of equilibrium for masticatory surfaces of natural dentures is an open question among authorities; the writer is inclined to accept the requirement of balance within a limited range of articulation.

Balanced occlusions of the masticatory surfaces present contact in stable equilibrium, with the exception of centric occlusion, which must be in unstable equilibrium presenting contact at two points or two multiple point areas, or two surface fragments, or two multiple surface fragment areas on either side about the second bicuspid and first molars.

Balanced Prosthetic Articulation of prosthetic dentures is a change from one balanced occlusion associated with an analogous jaw relation into other like associations, while the masticatory surfaces maintain contact.

Balanced Relations of the mandible to the maxillae are relations associated with balanced occlusions; such associations are conducive to maintain equilibrium.

Balanced Semi-Prosthetic Articulation of prosthetic dentures is a change from one balanced occlusion not

always associated with an analogous jaw relation, into other like associations, while the masticatory surfaces maintain contact.

Balanced Strained Ordinary Occlusions are occlusions conforming to accepted laws when under biting pressure in the mouth. Depending upon the magnitude, direction and distribution of the pressure exerted, and finally upon the releff of the supporting areas, the correctness of strained occlusions defy visual observation by the operator. The interpretation of the tactile sense and the response of the tissues of the patient is the best means by which the operator may detect cusp interference under strain.

Balanced Strained Ordinary Relations are relations associated with strained like occlusions.

Balanced Strained Relations are relations associated with strained, not necessarily like occlusions or with closures upon recording surfaces. Balanced strained relations are considered in the final grinding-in of restorations. They are difficult, if at all, determinable for intended magnitudes of pressures. A balanced strained relation is arrived at after a fashion through interpretation of the patient's tactile sense and appearing irritation of the tissues. A correction of the masticatory surfaces is often completed when irritation is eliminated. **Balanced Strained Relations are not used for initial articulator adjustments** with the Hanau technique.

Balanced Unstrained Ordinary Occlusions are occlusions conforming to accepted laws. "Unstrained" implies that no pressure is transmitted at the moment of occlusal contact when closing the jaws. Premature contact upon closure is readily detected by visual and digital examination or through interpretation of the patient's tactile sense.

Balanced Unstrained Ordinary Relations are relations associated with unstrained like occlusions.

Balanced Unstrained Relations are relations associated with unstrained, not necessarily like occlusions or with closures upon recording surfaces. They are readily registered and recorded by following the Hanau method of

making mandibular measurements and records for initial articulator and kinoscope adjustments.

The **Bite Record** is the record of a strained relation of the mandible to the maxillae. Individual bite records are differentiated by prefixing the relation registered, thus:

Centric relation bite record.

Protrusive relation bite record.

Left lateral relation bite record.

Intermediate relation bite record.

Cast Model is a replica of the areas of the oral cavity, cast in artificial stone or other suitable material. It is used as the master model.

Centric Occlusion is a contact relation of the opposed masticatory surfaces which conforms to accepted conceptions of interdigitation and contact relation of individual teeth.

Centric Relation: The mandible is in centric relation, when both condyle heads rest in the sockets of the fossae, irrespective of the jaw separation.

Centric Relation Bite Record: A strained centric relation record.

Centric Relation Record: A record of centric jaw relation.

Centric Relation Rest Record: An unstrained centric relation record.

Centric Relation Stop of an articulator is the T.M.E. of the posterior wall of the socket of the glenoid fossa.

Closing Component, see jaw separation.

Closing Movement is the component of closing in function of mastication, speech, breathing, etc.

Closing Surfaces and Areas are the techno-mechanical equivalents of occlusal surfaces. Occlusal rims, mouth and articulator relation records have closing surfaces and areas. Natural and artificial dentures have occlusal surfaces and areas.

Closing-the-bite: An expression widely used to indicate that jaw separation is being decreased by decreasing the height of the restoration.

Compound Records (see wax records).

Condylar (adj.) the techno-mechanical equivalent of the adjective "condyle."

Condylar Element, a spherical guiding element used with all Hanau instruments as the T.M.E. of the condyle head.

Condylar Guide of an articulator is the T. M. E. of the condyle guidance.

Condylar Indication denotes the angle reading of the condylar guide of an articulator.

Condylar Shaft is the pivotal element of the articulator jaw members; it is the techno-mechanical equivalent of the condyle axis or condyle line respectively.

Condylar Slot of the articulator is the T.M.E. of the condyle guidance.

Condyle (adj.) pertaining to the condyles in the anatomy.

Condyle Axis is the line through accepted condyle head centers (of the mandible).

Condyle Guidance: Those walls of the glenoid fossa which limit the excursion of the condyle head upon its path.

Condyle Heads: The upper posterior terminations of the mandible.

Condyle Head Centers: Marks applied to the skin denoting the location of accepted centers of the condyle heads.

Condyle Inclination: The angle of inclination of the condyle path with an accepted horizontal plane.

Condyle Line is the line through accepted condyle socket centers (of the maxillae).

Condyle Path is the upper wall of the glenoid fossa upon which the condyle head is guided in its anterior excursions.

Condyle Sockets are the posterior pockets of the glenoid fossae.

Cusp Height: The lateral projection of the actual height from summit to base of a cusp shall be accepted as cusp height in connection with the laws of articulation.

Extraoral (adj.) pertaining to or located outside the oral cavity.

Extraoral Records are records obtained through registrations outside the oral cavity.

Face-bow Mounting is the fixation of the cast model of the maxillary ridge in the articulator.

Face-bow Record is the record of the position of the patient's maxillary ridge in relation to his maxillary condyle line. It is a purely rotational relation.

Facebow Registration is the operation of securing a facebow record.

Face-bow Transfer is the operation of transferring the position of the maxillary ridge to the articulator.

Glenoid Fossae are the cavities in which the condyle heads have freedom of movement.

Guidances are guiding elements in the anatomy: Condyle path, incisal guidance.

Guides are guiding elements of instruments: Condylar slot, incisal guide, etc.

Incisal Guidance denotes the reciprocal guidance of the mandibular and maxillary anterior teeth.

Incisal Guide of an articulator is the T.M.E. of the incisal guidance in the anatomy.

All **Intermediate Occlusions** of the masticatory surfaces are more or less related to centric, protrusive, lateral, etc., occlusions, depending upon their spacial propinquity to these occlusions, and the magnitude, directions and points of application of forces acting.

An **Intermediate Relation** of the mandible to the maxillae is adjacent to centric, protrusive or lateral, etc., relation. Depending upon its spacial propinquity to a relation, the consideration of an intermediate relation becomes an important factor in deciding the correctibility of mal-associated occlusions.

Intraoral (adj.) pertaining to or located inside the oral cavity.

Intraoral Records are records obtained through registrations in the oral cavity (see mouth records).

Jaws: The mandible and the maxillae.

Jaw Members: The upper and lower parts of an articulator; they represent the T.M.E. of the jaws.

Jaw Relation: The positional relations of the mandible to the maxillae are designated **jaw relations**, or **relations only**.

JAW RELATIONS see:

- Balanced Relation
- Balanced Strained Ordinary Relation
- Balanced Strained Relation
- Balanced Unstrained Relation
- Centric Relation
- Intermediate Relation
- Jaw Separation
- Lateral Relation
- Left Lateral Relation
- Mal-Relation
- Natural Relation
- Opening Relation
- Ordinary Relation
- Protrusive Relation
- Rest Relation
- Right Lateral Relation
- Strained Relation
- Unbalanced Relation
- Unbalanced Strained Mal-Relation
- Unbalanced Strained Ordinary Relation
- Unnatural Relation
- Unstrained Relation

Analogously to the occlusions we differentiate jaw relations by their characteristics. There are ordinary (or normal) relations and mal-relations of the mandible to the maxillae, and these may be balanced or unbalanced and in addition either strained or unstrained. Further detail on this subject is published in an article by Dr. A. A. Nelson, Detroit, Mich., in Dental Items of Interest.

The classification of jaw relations is analogous—almost like that of occlusions.

We distinguish the following combinations:

1. Balanced strained ordinary relations.
2. Unbalanced strained ordinary relations.
3. Balanced strained mal-relations.

4. Unbalanced strained mal-relations.
5. Balanced unstrained ordinary relations.
6. Unbalanced unstrained ordinary relations.
7. Balanced unstrained mal-relations.
8. Unbalanced unstrained mal-relations.

For evident reasons we are not interested in relations listed under 2, 4, 6, and 8, while relations 1, 3, 5, and 7 are utilized for making measurements for transfers to and adjustments of the articulator and kinoscope. Relations 3 and 7 are always met in correction cases.

The relation of the mandible to the maxillae is that of leaves of a hinge with freedom of movement within the bearing laterally and forwardly from and perpendicular to the walls of the pivot bearings; the latter perpendicular freedom of movement is limited by the realeff.

Ordinary relations and mal-relations, upon application of force, are or are not conducive to maintain equilibrium; accordingly, they are balanced or unbalanced.

Jaws in ordinary or mal-relations, whether balanced or unbalanced, may or may not be under application of force, accordingly they are strained or unstrained.

We distinguish the following individual relations of the jaws:

1. **Rest relation** of the mandible to the maxillae.
2. **Centric relation** of the mandible to the maxillae.
3. **Protrusive relation** of the mandible to the maxillae.
4. **Left lateral relation** of the mandible to the maxillae.
5. **Right lateral relation** of the mandible to the maxillae.
6. **Intermediate relations** of the mandible to the maxillae.
7. **Jaw separation.**

Balanced and unbalanced relations are applied to relations in a purely geometrical sense; while strained and unstrained relations are used in a statical sense, implying the presence or absence of forces.

The mandible is in rest relation to the maxillae, when all muscles are relaxed and the masticatory surfaces apart.

The mandible invariably assumes this position shortly after enunciating the vowels at the end of a word, as in "Ohio", "do", "how", etc., also after the act of swallowing. Rest relation must not be confused with centric relation.

Jaw Separation is the opened or closed relation of the mandible to the maxillae; it infers a rotationally changed position of the mandible about the accepted mandibular condyle axis, irrespective of the relation the jaw separation is associated with.

An opening or a closing of the mandible in relation to the maxillae is associated with another jaw relation. The minimum jaw separation becomes definite for the artificial-denture-equipped masticatory apparatus, after it has been accepted for centric relation by the prosthetist.

Kinoscope: The designation adopted for an instrument designed to accommodate (sometimes exaggerated) theoretical requirements of maxillo-mandibular function.

Lateral Occlusions are contact relations of the masticatory surfaces having contact along the working side and at the posterior region of the balancing side. As a whole the mandibular masticatory surfaces are swung laterally in relation to the maxillary. The greatest intimacy of contact is found about the cuspids and at the last molar on the working side and at the last molar on the balancing side. The intimacy of contact decreases on the working side towards the second bicuspid and first molars, and on the balancing side towards the cuspids; and more rapidly with an increased prominence of the compensating curves. The contact about the cuspid on the balancing side is invariably lost. (Stable Equilibrium).

Lateral Relation: The mandible is in lateral relation to the maxillae, when the mandible has made an excursion to one side and laterally, or to one side, laterally and forwardly. Whenever a forwardly component is involved then the relation becomes a protruded lateral relation.

Left Lateral Occlusion infers an occlusion anterior to and to the left of centric occlusion.

Left Lateral Relation: The mandible is in left lateral relation to the maxillae, when the left condyle head has

made an excursion laterally, and the right condyle head an excursion forwardly and usually downwardly and inwardly, irrespective of the opening relation.

Lower Jaw Member of an articulator is the T.M.E. of the mandible.

Mal-Articulation is articulation not complying with accepted laws of articulation. Mal-Articulation lacks balance in toto or in part of function.

Mal-Occlusion is a contact relation of the masticatory surfaces not conforming to accepted laws of occlusions.

Mal-Relations of the mandible to the maxillae are relations not associated with like occlusions, thus they are not conforming to accepted laws; they are ordinary relations inharmoniously associated with occlusions.

On rare occasions it seems indicated to associate balanced centric occlusion of the masticatory surfaces with a protruded, a lateral or a protruded-lateral relation of the jaws. Such association of relations with unlike occlusions is selected in exceptional cases for weighty reasons, and should be considered a compromise—they are acceptable only, if of no discomfort to the patient, then of course, we may speak of abnormal relations.

Mandible: The osseous and tissue structures of the lower jaw.

Mandibular Movements infer the movements of the mandible as a whole or of particular points under consideration.

Masticatory Apparatus in prosthetic dentistry designates the oral cavity and the adjacent tissues involved in masticatory function.

Masticatory Surfaces of natural and artificial teeth are the tooth surfaces which are engaged in crushing, grinding, incising etc. of food.

Maxillae: The osseous and tissue structures of the upper jaw about the oral cavity.

Maxillo-mandibular (adj.) pertaining to the mandible and the maxillae.

Mixed Articulation infers balanced articulation to and from centric occlusion, part of the masticatory stroke only.

Mixed articulation is not accepted as correct for prosthetic dentures, because it makes their function deficient. Rather frequently mixed articulation is found in natural dentures. If the balanced articulation is confined to the initial part of articulation from centric occlusion of a natural denture, then—with the present understanding of physiological requirements—it should not be defined as mal-articulation; it seems more appropriate to describe the unbalanced continuation of articulation in the incisal region of natural dentures with over-articulation.

Mounting Cast is a duplicate cast model, not necessarily complete, but having sufficient seating for accurately and securely retaining a restoration in an articulator.

Mouth Records are anatomical records made in the mouth; they are also termed intraoral records.

Natural Articulation is articulation of natural or prosthetic dentures conforming to accepted physiological requirements for comfort and efficacy.

Natural Dentures constitute a more or less complete set of deciduous, mixed or permanent dentures.

Natural Occlusion is an occlusion of natural or prosthetic dentures conforming to physiological requirements.

Natural Relations are jaw relations assumed with comfort and efficacy in rest and function.

Occlusal Rims are dummy dentures used for preliminary work in denture construction.

Occlusal Surfaces: The surfaces of opposed natural and artificial teeth making contact upon closure and functional excursions.

Occlusions are contact relations of the masticatory surfaces.

OCCLUSIONS see:

Balanced Occlusion

Balanced Strained Ordinary Occlusion

Balanced Unstrained Ordinary Occlusion

Centric Occlusion

Intermediate Occlusion

Lateral Occlusion

Left Lateral Occlusion
 Mal-Occlusion
 Natural Occlusion
 Ordinary Occlusion
 Protrusive Occlusion
 Retrusive Occlusion
 Right Lateral Occlusion
 Strained Occlusion
 Unbalanced Occlusion
 Unbalanced Strained Mal-Occlusion
 Unbalanced Strained Ordinary Occlusion
 Unnatural Occlusion
 Unstrained Occlusion

The main groups of occlusions are (1) ordinary (or normal) occlusions and (2) mal-occlusions. These designations apply to the tooth alignments which either do or do not conform to accepted laws of occlusions, whatever these may be. Furthermore, a subdivision of occlusions is given by the differentiation of **balanced** and **unbalanced** occlusions, and another, by the differentiation of **strained** and **unstrained** occlusions. In consequence, ordinary occlusions may be balanced or unbalanced, and in addition to one of these properties, strained or unstrained.

Thus, ordinary occlusions and mal-occlusions respectively, possess various characteristics, and we distinguish the following occlusions:

1. Balanced strained ordinary occlusions.
2. Unbalanced strained ordinary occlusions.
3. Balanced strained mal-occlusions.
4. Unbalanced strained mal-occlusions.
5. Balanced unstrained ordinary occlusions.
6. Unbalanced unstrained ordinary occlusions.
7. Balanced unstrained mal-occlusions.
8. Unbalanced unstrained mal-occlusions.

We are not interested in items 2, 4, 6 and 8, which comprise unbalanced occlusions of the various kinds, except, that they are the occlusions which we must avoid or correct.

Occlusions under 1, 3, 5 and 7 are used unconsciously when associated with like relations when making measurements for transfers to and adjustments of the articulator and kinoscope.

The establishment of balanced occlusions is of utmost importance in the construction of dentures, and particularly in the alignment of the teeth. The dentures must ultimately function, be comfortable in the mouth, and have a pleasing appearance.

We will now enumerate and define in outline the various individual occlusions to be considered.

Centric occlusion of the masticatory surfaces,
Protrusive occlusion of the masticatory surfaces,
Retrusive occlusion of the masticatory surfaces,
Left lateral occlusion of the masticatory surfaces,
Right lateral occlusion of the masticatory surfaces,
Intermediate occlusion of the masticatory surfaces.

Balanced and unbalanced are applied to occlusions in a purely geometrical sense; while strained and unstrained occlusions are used in a purely statical sense, implying the presence or absence of forces.

Occlusions associated with an opening component of the jaws occur within the scope of articulation. The opening components with all occlusions are referred to the accepted centric occlusion of the jaws when forces are not acting, i. e., they are referred to the unstrained balanced centric occlusion.

Opening Component (see jaw separation).

Opening Movement is the component of opening in function of mastication, speech, or breathing, etc.

Opening-the-bite: An expression widely used to indicate that jaw separation is being increased by increasing the height of a restoration.

Opening Relation (see jaw separation)

Ordinary Articulation is an articulation complying with accepted laws of articulation. Ordinary articulation is always balanced with admitted limits of realeff.

Ordinary Occlusion is a contact relation of the masticatory surfaces conforming to accepted laws of occlusions.

Ordinary Relations of the mandible to the maxillae are relations conforming to accepted laws of relations and associated with like occlusions.

Plane of Orientation is a plane accepted through the central incisal contact point and the bucco-distal cusps of the second molars. The inclination of the plane of orientation becomes evident **after** a case is mounted on an articulator. Applying the Hanau method it is customary to mount a case so that the actual or accepted incisal contact point is on a level with the groove around the incisal pin of the Hanau instrument.

Plaster Records (see wax records)

Prominence of the Compensating Curve denotes the character of the lateral projection of the alignment of the teeth posterior to the cuspids.

Prosthetic Articulation infers the articulation of prosthetic dentures in the mouth; individual occlusions being associated with analogous jaw relations.

Protrusive Occlusion is a contact relation of the mandibular masticatory surfaces anterior to centric occlusion; it presents most intimate contact at the incisal edges and at both posterior extensions of the arches. The intimacy of contact decreases towards the second bicuspid and first molars. In fact, contact is lost towards those regions very rapidly with an increased prominence of the compensating curves. (Stable equilibrium).

Protrusive Relation: The mandible is in **protrusive relation** to the maxillae, when both condyle heads have made excursions forwardly and downwardly from their sockets in their fossae, irrespective of the jaw separation.

Quint or Articulation Quint: A graphical figure relating the ten laws of articulation.

Realeff designates: Resilient and like effect. The term is coined by contracting the words REsilient And Like EFFect, utilizing the capital letters.

A Record is the fixation of a registration by means of a suitable instrument, device or material; data and notes of position, shapes, magnitudes, directions, etc. are records.

RECORDS see:

- Anatomical Record
- Articulator Record
- Bite Record
- Centric Relation Bite Record
- Centric Relation Record
- Centric Relation Rest Record
- Compound Record (see Wax Record)
- Extraoral Record
- Facebow Record
- Intraoral Record
- Mouth Record
- Plaster Record (see Wax Record)
- Remounting Record
- Rest Record
- Wax Record

Registration is the operation of securing a record. The definition of various registrations becomes self-explanatory from the records to be secured. Registration of centric jaw relation is the operation of securing a record of centric relation by interposing a layer of more or less softened wax or other suitable material between the closing surfaces of occlusal rims, or their equivalents.

Jaw relations are also registered by tracings of mandibular excursions, thus tracing records are obtained.

Relation, see Jaw Relation, of which it is the accepted abbreviation.

Remounting Record is a face-bow (or equivalent) articulator record of the position of a restoration set up in wax to be used for remounting after vulcanization.

The **Rest Record** is the record of an unstrained relation of the mandible to the maxillae. Individual rest records are differentiated by prefixing the relation registered, thus:

- Centric relation rest record
- Protrusive relation rest record
- Left lateral relation rest record
- Right lateral relation rest record
- Intermediate relation rest record

Rest Relation of the mandible to the maxillae is that relation in which all tissues and muscles are relaxed to an extent counteracting the force of gravity only, while the "head is upright." In this position the jaws are slightly opened from centric relation, and the masticatory surfaces become separated from 1 to 2 mm. The rest relation has occasionally been referred to as the normal relation of the jaws. It shall not be considered so here.

Retrusive Occlusion is a contact relation of the mandibular masticatory surface posterior to centric occlusion.

Right Lateral Occlusion infers an occlusion anterior to and to the right of centric occlusion.

Right Lateral Relation of the mandible to the maxillae is a (mirror) image of the left lateral relation.

Seating Areas are those areas of a restoration which are adapted to maintain immediate contact with the supporting tissues.

Semi-Prosthetic Articulation infers the articulation of prosthetic dentures in the mouth; individual occlusions being not always associated with analogous jaw relations.

Stability is the resistance against dislodgement offered by an inserted restoration.

Strained Articulation is articulation while forces act, namely, when pressure is applied.

Strained Occlusion of the masticatory surfaces is not an independent occlusion; it is associated with one of the above mentioned occlusions, whenever muscular forces act, i. e., when pressure is applied.

Strained Relations of the mandible to the maxillae are relations associated with strained occlusions.

A strained relation of the mandible to the maxillae is not an independent relation; it is associated with a main relation or an intermediate relation whenever muscular forces are acting, i. e., when pressure is applied.

Supporting Areas, Supporting Tissues, Supporting Tissue Areas: Those areas of the tissues upon which rest restorations or parts thereof.

Taking-the-bite is a very misleading term, unfortunately very commonly used to designate the recording of centric jaw relation.

Tooth Alignment: The mesio-distal array of natural or artificial teeth.

Unbalanced Articulation is the change from one occlusion into another, while the masticatory surfaces maintain contact, but balance is interrupted or lacking. Unbalanced articulation does not comply with accepted laws of articulation. Unbalanced articulation induces a patient to perform mal-articulation (if he accepts it at all). It invariably forces the patient (if he tolerates it) to acquire the habit of performing unnatural articulation, along lines of least resistance and to seek rest in positions of minimum discomfort.

Unbalanced Occlusion is contact relation of the masticatory surfaces, tending to disturb equilibrium when forces act. Unbalanced occlusion is always mal-occlusion for prosthetic dentures.

Unbalanced occlusions are occlusions having less than three point, etc., contact. The occlusal contact of unbalanced occlusions is characterized by cusp interferences commonly leading to tissue trauma. Cusp interferences and tissue trauma induce a patient to accept unnatural occlusions and unnatural relations.

Unbalanced Relations of the mandible to the maxillae are relations associated with unbalanced occlusions.

Unbalanced Strained Mal-occlusion is that occlusion which causes trauma in function.

Unbalanced Strained Mal-relation are the jaw relations which are unavoidably registered by those who advocate to make bite-records for articulator adjustments. The Hanau intraoral recording method rejects all "Strained" relation records whether balanced or unbalanced, for **initial** articulator adjustments.

Unbalanced Strained Ordinary Occlusion is an occlusion correctly set up on an articulator and forced by pres-

sure into correct interdigitation in the mouth where the supporting tissues are unduly displaced.

Unbalanced Strained Ordinary Relation is an acceptable strained jaw relation.

Unnatural Articulation is an articulation of natural or prosthetic dentures not conforming to accepted physiological requirements or to individual requirements of a case.

Unnatural Occlusion is an occlusion of natural dentures or prosthesis not conforming to accepted esthetic or physiological requirements or to individual requirements of a case.

Unnatural Relation is a jaw relation not employed within the range of natural function.

Unstrained Articulation is function while no forces act, namely, when pressure is not applied.

Unstrained Occlusion of the masticatory surfaces is not an independent occlusion; it is associated with one of the above mentioned occlusions, whenever muscular forces do not act, i. e., when pressure is not applied.

Unstrained Relations of the mandible to the maxillae are relations associated with unstrained occlusions.

Upper Jaw Member of an articulator is the T.M.E. of the maxillae.

Wax (compound, plaster, wire or other material) **Records** infer a moulding, casting or forming of wax or the other materials into a matrix suitable to register and record positional relations or contours.

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